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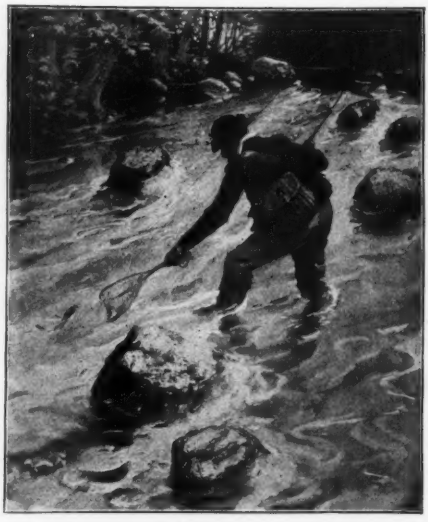

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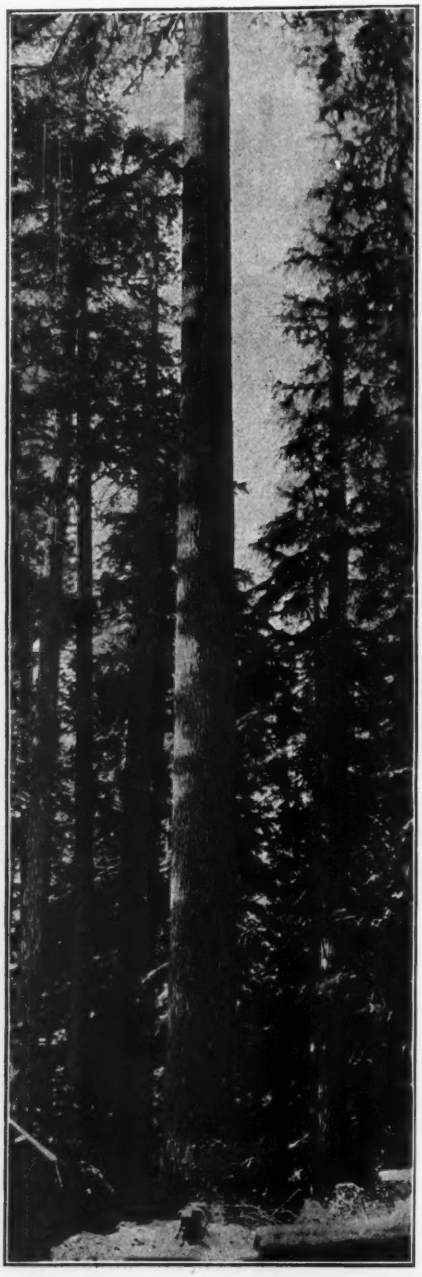

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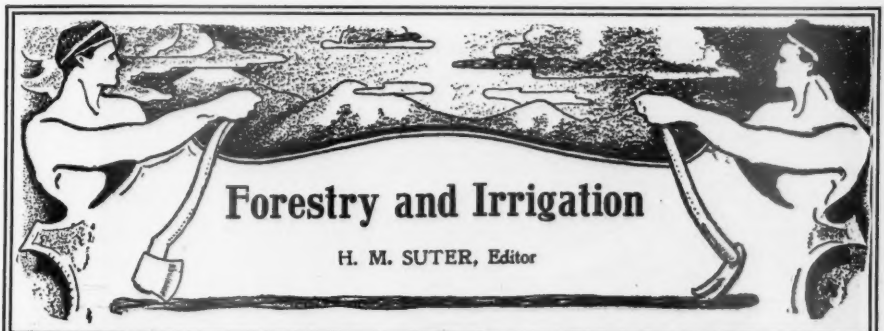

Forestry and Irrigation

H. M. SUTER, Editor

CONTENTS FOR JUNE, 1904

BOARD OF CONSULTING ENGINEERS . . . . . *Frontispiece*

NEWS AND NOTES

Colorado River Project	239	Manufacturers Favor Forestry and Irrigation	243
Hawaii Favors Forestry	239	Forest Fire Record	244
Yale Summer School	239	Connecticut Forests	244
Agricultural Land in Forest Reserves	240	Additions to Reclamation Service	245
The Benefits of Irrigation	240	New Forest Reserves	245
In the Yakima Valley	241	Examination of Forests	245
Reclamation of Central Oregon	241	Forest Reserve Personals	246
Favor Malheur Project	241	Warning to Homeseekers	247
Public Notice	241	Study of Water Laws	247
Work of Yale Seniors	242	To Utilize Grand River	247
Dr. Rothrock Resigns	242	Difficult Reclamation Problem	248
An English Forest School	242	Inyo County, California	248
Forestry Session of Women's Clubs	243		

MR. A. L. FELLOWS (*with portrait*) 249

WILDERNESS RESERVES (*Illustrated*) . . . . . President Roosevelt 250

TWO YEARS OF RECLAMATION WORK 260

PLANTING WHITE PINE (*Illustrated*) 264

FOREST THINNING AND ITS RESULTS . . . William F. Hubbard 268

RECLAMATION WORK IN NEW MEXICO (*Illustrated*) 271

FOREST LEGISLATION IN NEW YORK 273

SETTLERS SEEKING GOVERNMENT AID 279

FOREST PROBLEMS OF MICHIGAN . . . . . John Bissell 280

NATIONAL IRRIGATION IN WYOMING (*Illustrated*) 281

GOVERNMENT FORESTRY EXHIBIT 283

FOREST FIRES IN MINNESOTA 285

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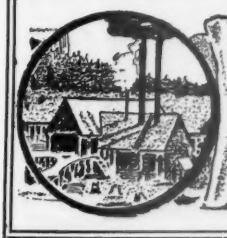

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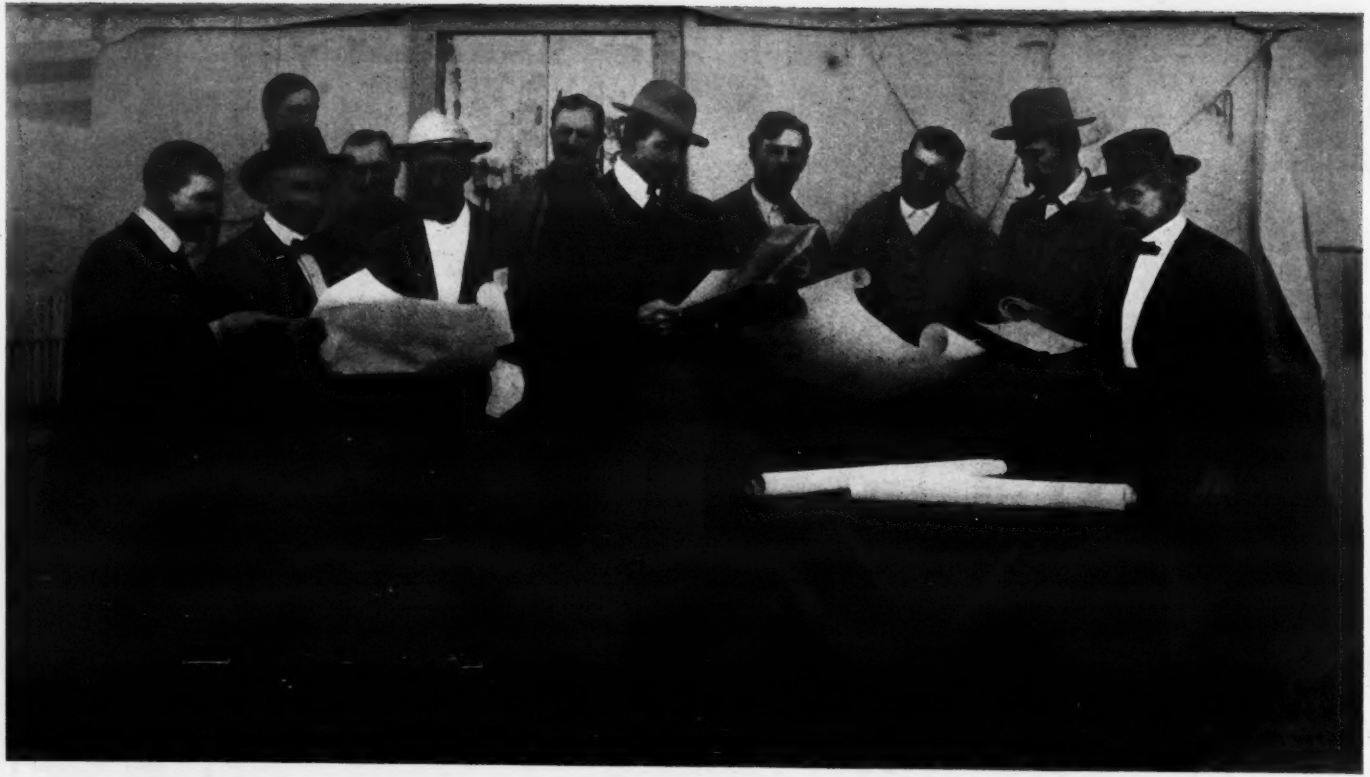

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BOARD OF CONSULTING ENGINEERS OF THE YUMA RECLAMATION PROJECT.

Forestry and Irrigation.

VOL. X. JUNE, 1904. No. 6.

NEWS AND NOTES.

Colorado River Project. Mr. F. H. Newell, Chief Engineer of the U. S. Reclamation Service, recently left Washington for Yuma, Arizona, to begin the investigation of conditions along the Colorado River, in accordance with the resolution of Congress, introduced by Senator Bard, directing the Secretary of the Interior to institute an investigation and prepare a report to Congress on the various questions involved in connection with the use of the waters of the lower Colorado River.

He is accompanied by Mr. William C. Pollock, one of the assistant attorneys detailed from the office of the Assistant Attorney General for the Interior Department. There will also be at Yuma Mr. J. B. Lippincott, Supervising Engineer for California; Morris Bien, of California, the legal adviser of the Reclamation Service; also other engineers and experts in various lines. It is probable that Senator Bard will join the party at some point in southern California.

From Yuma the party will proceed to Imperial and, after a brief examination of the conditions, will go to Los Angeles, and there consider the prepation of a report to the Secretary.

Hawaii Favors Forestry. Resolutions strongly favoring the consolidation of all government forest work under the control of the Bureau of Forestry, and applauding the policy of that Bureau, and with recommendations looking to the preservation of the forests, were adopted on April 28 by the Honolulu Chamber of Commerce. The resolutions favor a more adequate system of fire patrol on government preserves, suggesting the advisability of detailing United States troops for that duty during the season of danger. The policy of the Bureau of Forestry is heartily indorsed and confidence expressed in its officers as to their judgment in the selection of areas for the establishment of reserves. The resolutions strongly advocate that that part of federal forest work now under the jurisdiction of the General Land Office and the U. S. Geological Survey be transferred to the control and management of the Bureau of Forestry. The resolutions are, in effect, a complete and hearty indorsement of the present plans and future aims of the Bureau, and in text and meaning are nearly identical with those recently adopted by the Denver Chamber of Commerce and Board of Trade. The adoption of these resolutions is a good sign. It indicates the awakening of the solid, substantial business people to a realization of the importance of forestry, and the indorsement of its aims by such a class of citizens is an excellent sign.

Yale Summer School. The fourth annual session of the Yale Summer School of Forestry will open on July 1 at Grey Towers, the estate of Mr. James W. Pinchot, near Milford, Pike county, Pa. Prof. J. W. Toumey is director of the school, with Prof. Arthur H. Graves as instructor and Professors William H. Brewer, H. S. Graves, and Gifford Pinchot as special lecturers. A number of additional lectures will be given by persons as yet not designated. As stated in the prospectus of the school, the courses are arranged with a view of providing instruction in forestry to those who do not wish to take, or who are not yet ready for, the more advanced technical courses at the regular forest schools. The courses include instruction in for-

est botany, silviculture, forest mensuration, introductory lectures in forestry, forest protection, research work in forestry, forest policy of the United States, forest influences, and forest regions of the United States. Practical work in the field will supplement each course, and frequent excursions in the woods will be made with a view of familiarizing the student in the identification of tree species.

Agricultural Lands in Forest Reserves. A recent letter to the editor contains an excellent point on the subject of the disposition that should be made of the small bits of agricultural lands included in the government forest reserves. The writer is fully qualified to speak and we republish his letter in full:

"I noted with interest in the last issue of FORESTRY AND IRRIGATION the paragraph on 'Agricultural Land in the Forest Reserves.'

"The arguments presented are good, but in the reserves of the Sierra Nevada, and I think elsewhere, there is another strong reason why the small parks and open valleys should not be excluded from the reserves. It is that many of these grassy areas are a necessity to the rangers as grazing ground for their horses.

"In the mountains the question of horse feed is a vital one to every man who rides the range, and the task of finding sufficient grass for his saddle and pack animals is a difficult one for many rangers. If the mountain meadows and parks are excluded from the reserves and come into private hands, or the range cattle are allowed to graze on them unrestricted, the ranger is liable to find himself after a hard day's ride without feed for his horses. To 'pack' hay or grain enough is impossible because of the excessively high prices for such supplies in the mountains and the distance they must be carried. The only resource for the ranger is to 'stake' or 'hobble' his animals every night in some mountain meadow; hence the necessity of preserving these grassy feeding grounds.

"As to this working hardship to prospective settlers, it is all idle talk, because not one mountain park in fifty can be made to support a family, and to settle on them means starvation unless other means of livelihood are at hand. The deserted cabins and abandoned home sites in the mountains attest to the futility of attempting to develop these small isolated patches of so-called agricultural land."

The Benefits of Irrigation. Chief Engineer Newell has received an interesting communication from a well-known citizen of Montana, giving a brief description of the results which followed the construction of an irrigation ditch in the vicinity of Missoula.

In 1900 a tract of land containing 2,185 acres was purchased, upon which at that time four families were residing and having a hard struggle to make a living. An irrigation system costing about $5,000 was constructed, the laterals covering about 480 acres. As soon as the water was turned in the ditch this land was put on the market at $200 per acre, on five years' time, the purchaser paying 10 per cent of the purchase price down and the balance in 60 equal monthly payments. There was no difficulty in disposing of the land at this price.

Some of the owners of five-acre tracts are now getting as much as $1,500 each year from the sale of the products of their farms. Last year 10 acres of this land sold for $3,300, the same tract having been sold for $2,000 in 1901.

The success of the first ditch was so pronounced that another and larger irrigation system, costing $1,900, was constructed to reclaim the balance of the tract. It has practically all been sold at from $150 to $200 per acre since the ditch was finished. As an illustration of what water will do on Montana land, this is probably as good an example as can be furnished.

In 1900 there were but four farms of 2,185 acres. Today there are 400 families living in prosperity and content and deriving a comfortable living from the cultivation of tracts which in other sections of the country would not be considered as fair-sized gardens.

In the Yakima Valley. Chief Engineer Newell has directed that a careful investigation be made of the Yakima Valley, with a view of ascertaining if there is a feasible reclamation project in that district. Resident Engineer Noble, at Spokane, has instructed Assistant Engineers Bliss and Harley to begin a reconnaissance of the valley and prepare a report upon the physical conditions, the stream measurements, and the available dam sites at the proposed reservoirs at the head waters of the Yakima River.

Congressman Jones has been very earnest in urging upon the Department the importance of making this investigation.

Reclamation of Central Oregon. At the request of Senator Mitchell, a reconnaissance party will proceed late in June to make an investigation of the central part of Lake county, Oregon, with a view to ascertaining whether there is a feasible location for the construction of a large irrigation work by the government.

Senator Mitchell describes this district as having a fine climate, where all cereals, fruits, and vegetables that are cultivated in any part of Oregon grow abundantly, and where there is a large body of fine agricultural land. The Chewaucan River, which flows through this section of the county, is reported to furnish an ample supply for the reclamation of nearly, if not quite all of these lands.

It has been reported to Senator Mitchell that reservoir sites can be secured to hold the flood waters at different points along the stream. As Lake county has contributed probably as much as any other county in the state to the arid-land fund, the citizens of that district are exceedingly anxious that this project shall receive early consideration.

Favor Malheur Project. Chief Engineer Newell, of the U. S. Reclamation Service, has received a letter from Ira S. Smith, Vale, Oregon, President of the Malheur County Board of Trade, in which he assures the Department that the citizens of the valley are very enthusiastic over the prospect of the early completion of the Malheur Project.

He states that they are ready and anxious to assist in the adjustment of all existing water rights which are likely to conflict with the government plans, and offers to coöperate in every possible way in order to secure the early commencement of the government work.

Public Notice. The Secretary of the Interior has issued the following public notice regarding lands embraced in the ceded portions of the Crow Indian Reservation in Montana:

Warning is hereby given to all persons against trespassing upon the ceded portion, or any other portion, of the Crow Indian Reservation, Montana. By act of Congress approved April 27, 1904 (Public, No. 183), the agreement with the Indians of said reservation, dated August 14, 1899, providing for the cession of the northern portion of their said reservation, was ratified, with amendments, and provision made for the manner of the disposal of said land. It is provided (1) that the survey and subdivision of said ceded lands shall be completed; (2) that allotments of land shall be made to the Indians residing on said ceded portion, or, if they elect to remove to the diminished reservation, that their improvements shall be appraised and sold; and (3) that it shall be ascertained by the Secretary of the Interior what feasible irrigation projects may be found within said tract, and that the lands required for such projects shall be withdrawn for reclamation and disposition under the provisions of the reclamation act of June 17, 1902.

Thereafter, in accordance with the provisions of said act of April 27, 1904, the lands not withdrawn for such irrigation projects, and not allotted or otherwise disposed of, shall be opened to settlement by proclamation of the President, "which proclamation shall prescribe the manner in which these lands may be settled upon, occupied, and en-

tered by persons entitled to make entry thereof, and no person shall be permitted to settle upon, occupy, or enter any of said lands, except as prescribed in such proclamation, until after the expiration of sixty days from the time when the same are opened to settlement and entry."

This provision of law is clear and specific as to the time when prospective settlers may go upon said ceded lands, and all prospective settlers are therefore warned not to go thereon, under any circumstances, prior to the date hereafter to be fixed and determined. Any person violating this provision of law will be dealt with as a trespasser, in accordance with the statutes of the United States applicable thereto. No prior rights can be acquired by persons going upon the lands in advance of the date fixed, and when the same come to be opened no preference will be given to such illegal entrymen, regardless of any previous settlement or location; on the contrary, their trespass is liable to work to their disadvantage when the lands are actually opened.

Work of Yale Seniors. The Senior Class of the Yale Forest School is at Milford, Pennsylvania, for the concluding months of the course, in accordance with the regular plan of the school. The students have been hearing lectures and taking practical work in forest mapping from Mr. Austin Cary, of Maine, and in fish culture and game preservation from Dr. Barton W. Everman, of the Fish Commission, in addition to the continuation of the regular courses. The object of moving the work in the spring to Milford, which is the site of the Yale Summer School of Forestry, is to afford opportunity for field work, which could not be carried out so effectively at New Haven.

Dr. Rothrock Resigns. Readers of FORESTRY AND IRRIGATION will regret to learn that owing to ill health Dr. J. T. Rothrock has tendered his resignation to Governor Pennypacker as State Forestry Commissioner of Pennsylvania.

The resignation was immediately accepted, and Robert S. Conklin, of Columbia, was appointed Commissioner. Mr. Conklin is the present Deputy Commissioner, and he has been actively connected with the state forestry work in Pennsylvania for several years.

Dr. Rothrock has been the leader of forest movement in Pennsylvania, and has been connected with the Forestry Commission since it was created. He has served as Forestry Commissioner under four governors, and to his unusual devotion to duty much of the state's advance in forest matters is directly traceable.

An English Forest School. Some insight into English methods of forestry education is obtainable from the following account of Dean Forest School, reprinted from the London *Leader:*

"The school of forestry started by the Commissioners of Woods and Forests at Coleford, in the Forest of Dean, is proving a great success.

"When the Departmental Committee appointed by the Board of Agriculture to inquire into the state of British forestry reported at the end of 1902, the Commissioners of Woods and Forests took up the question of education for foresters and woodmen.

"The claims of the Forest of Dean had been strongly urged by Sir Charles Dilke, the member for the division, as against Alice Holt Woods in Hampshire, and the Commissioners chose Dean Forest for a school. It had the additional advantage of having been worked for the last six years under a scientific plan prepared by the late Mr. Hill, head of the Indian Forest Department.

"Class-room accommodation was found at the Crown offices at Coleford for 20 students, and the services of Mr. C. D. Hanson, of the Indian Forest Department, were obtained as instructor. It was decided to start with a small class only at first, and the school was opened in January last with 9 students. The first three months' working is considered very satisfactory.

"The students are all in the employ of the Crown, 7 being from Dean Forest and 2 from Windsor Forest. Classes are held two days a week, the students working in the woods the remainder of the time. Their ages vary from 17 to 22, and they receive from 12s. to 18s. a week.

"The education is free, and no deduction is made from wages. The full course will extend over two years. Instruction will be given in all branches of forestry, theoretical and practical, including choice of soils and situations to grow the more important British forest trees; the method and treatment for each species, and the best methods of sowing, planting, thinning, and pruning to produce sound timber. The students will be taught to recognize the more important fungi and insects, and the means of prevention and cure.

"Such operations as measurement and valuation of timber and standing woods will be dealt with, and the system of management to produce annual yield explained. In view of the thorough training they will get, there should be no difficulty in the students obtaining good situations, as the supply of trained foresters is limited, and many landowners complain of the difficulty of getting them.

"It is hoped to start a second class next year, and it may be possible to arrange to receive men from private estates, but it will be impossible for the Crown to take more than a limited number of paid workmen, as sufficient employment could not be found for them in the woods."

Manufacturers Favor Forestry and Irrigation. The annual convention of the National Association of Manufacturers, held at Pittsburg in May, showed a notable interest among the delegates in the subjects of forestry and irrigation. Mr. George H. Maxwell, executive chairman of the National Irrigation Association, was invited to address the convention, and his remarks created a most favorable impression.

The association appointed a standing Committee on Irrigation and passed a series of significant resolutions. These resolutions strongly urge that Congress should repeal the desert act and the commutation clause of the homestead act. They also urged the national government to proceed as rapidly as possible with its work of reclaiming the arid public lands. Strong indorsement is contained in these resolutions of the recommendation of the Secretary of the Interior and the Public Lands Commission appointed by President Roosevelt for the repeal of the timber and stone act. The resolutions further urge that all public forest lands should be embraced in the permanent forest reserves. It was the unanimous opinion of the association that all forestry work of the national government should, as recommended by President Roosevelt, be consolidated in the Bureau of Forestry of the Department of Agriculture.

Forestry Session of Women's Clubs. May 24 was set aside at the general federation biennial of Women's Clubs at St. Louis as a forestry session, and reports on the progress of forest protection from members representing standing committees in thirty-four states were present and engaged in discussion. Mrs. L. P. Williams was in the chair, and spoke of progress made in Minnesota through the instrumentality of the Morris act. She also addressed the meeting on the subject, "Can Woman Through Organization Influence Legislation in Favor of Forestry?" Miss Mira L. Dock, a member of the Pennsylvania Forest Commission, was present, and spoke on "Ten Years of Forestry." The gain in growth of the idea of forest protection among women's clubs is evidenced by the remarkable increase in committees devoted especially to the work. The federation, after two years, now has standing committees enrolled from thirty-four states that are enthusiastically spreading the propaganda of tree planting and forest preservation, both of which are included in the scope of the department. The remarks of delegates were interesting, inasmuch as they

gave an idea of the working methods of the department. Trees and cuttings have been planted; insects injurious to trees have been exterminated; new species of trees introduced; forest reserves advocated, and general measures looking to the preservation of the forests suggested. The women's clubs are doing a great work in the spreading of information relating to the tenets of forestry and its teachings.

Forest Fire Record. Following the meager reports of more or less incipient forest fires, as mentioned in the May number of FORESTRY AND IRRIGATION, come advices of fires of increasing gravity, principally from sections in which a dry spring has favored their spread. Locomotive sparks have been an additional accessory and in many cases added to their impetus. The states of Wisconsin, Minnesota, and Michigan have experienced such a spring, and, judging from newspaper reports, the first named has suffered severely. Several houses were lost in the vicinity of Rhinelander and Wittenberg, a number of barns have been burned, and several hundred cords of wood and much live stock were destroyed. In Bayfield county, as late as May 30, damage was reported from fires which in one instance threatened the destruction of a small town, Cornucopia. Along the line of the Michigan and Wisconsin railroad and the Soo line much apprehension was felt, owing to the threatened destruction of large quantities of cedar timber and ties piled along the roads in the fire zone. More loss has been occasioned through destruction of buildings, crops, cut timber, and live stock, however, than to standing timber, as the lands burned over were of little worth. In Minnesota several small fires were reported in the vicinity of Eveleth, but no great amount of damage was inflicted. Near Menominee, Michigan, forest fires destroyed considerable cut timber. In Arizona the rangers of the Black Mesa Forest Reserve had to fight an incipient blaze which traveled several miles. Forest fires in the Mogollon Mountains, in the Gila River Forest Reserve in New Mexico, demanded some attention from rangers on May 18, but, owing to immediate fire-fighting, no serious damage was done to the fine timber in the heart of the Mogollons, as was at first anticipated. High winds favored the progress of a number of small but destructive fires in the Blue Ridge Mountains of Virginia, in Rappahannock county, and North Carolina also experienced forest fires of a minor character near Castle Haynes. In New Jersey press reports indicate the destruction of a number of houses and several cranberry bogs in the vicinity of Doughty's Tavern, and several scattered fires have burned over valuable woodland. In Pennsylvania, near Bloomsburg, a large amount of standing timber was burned in a fire started presumably from locomotive sparks.

Connecticut Forests. The work which the Connecticut Forestry Association is doing in protecting the forests of the state and in having the waste lands of Connecticut utilized by forest growth was explained by Walter Mulford, the state forester, at the annual meeting of the association, held at Hartford recently.

The state forest in the town of Portland contains 900 acres, which was bought at an average price of $1.65 an acre. The first appropriation by the state was $2,000 in 1901. All but 6 cents of this appropriation has been spent, and the appropriation of $2,000 made in 1903 is being utilized. The state forest in Portland is being used to show people the method of treating woodland in raising a crop of timber and to induce private owners of woodlands to give them better care by showing them that it is profitable to do so. The future work on the state forest will be in the nature of thinning out the trees to obtain a better growth and the sowing of chestnut, oak, and pine.

The state forestry association has recently notified the granges of the state that lectures on the subject of forestry will be furnished without expense, and the association proposes to secure some

form of law for the protection of forests from fires.

President—Walter Mulford, of Windsor.

Vice-presidents—Henry Ferguson, of Hartford; T. S. Gold, of West Cornwall; Willis I. Twitchell, of Hartford.

Secretary—Everett S. Geer, of Hartford.

Corresponding secretary—Miss Mary Winslow, of Weatogue.

Treasurer—Alfred Spencer, Jr., of Hartford.

Auditor—Appleton R. Hillyer, of Hartford.

Advisory board—The above officers and Major E. V. Preston, P. Henry Woodward, John L. Denison, and Rev. John T. Huntington, Hartford; George Griswold, Old Lyme; Mrs. Jessie B. Gerard, South Norwalk; Dr. E. H. Jenkins, Edward A. Bowers, and Alfred Ackerman, New Haven; E. K. Hubbard, Middletown; Robert Scoville, Chapinville.

Additions to Reclamation Service. Thomas H. Means, engineer of soils, and Thomas F. J. McGuire, electrical expert, have joined the Reclamation Service and are detailed upon important work in the West. Mr. Means, who was, until his transfer, connected with the Bureau of Soils, Department of Agriculture, was in charge of the United States Soils Survey, and was particularly expert in alkali problems and in reclaiming alkali lands. Two years ago he made a trip to Egypt to study reclamation matters there in relation to our own questions, and is now recognized as the foremost expert on alkali soils in this country. His services will be called on in the designing of plans for establishing systems of drainage in connection with irrigation works and for making classifications of soils in the sections to be reclaimed. His new position will offer even a better field for his work than his former one, and he will have a better chance to make his services valuable to the sections of country in which he works.

Mr. McGuire, who is an expert in electric installation, will assist in supervising the placing of power plants at the various reservoir and dam sites in the West, such as the one contemplated at the Tonto works in Arizona, where it is proposed to develop electricity for general power purposes, and particularly for pumping, in connection with the distribution of water.

New Forest Reserves. Four new forest reserves have recently been created by proclamation of President Roosevelt. The entire area represents an acreage of 245,920 in Utah and South Dakota. On March 5 two reserves were set aside in Butte county, S. Dak., designated respectively the Cave Hills Forest Reserve and the Slim Buttes Forest Reserve. Captain Seth Bullock, superintendent of the Black Hills Forest Reserve, has been placed in charge. On May 7 the Grantsville Forest Reserve, in Utah, was established, with an area of 68,960 acres, and on May 26 an area of 95,410 acres in the same state was reserved under the name of the Salt Lake Forest Reserves. In addition to these changes in the area of the government's forest reserves, several reductions and additions have been made to existing reserves. The most important of these have been: May 2, the Fish Lake Forest Reserve (Utah), addition of 131,200 acres, making the present area 199,040 acres; May 4, Yellowstone Forest Reserve (Montana and Wyoming), reduction of 518,600 acres, leaving present area 7,810,600 acres; May 16, Battlement Mesa Forest Reserve (Colorado), reduction of 45,440 acres, leaving the present area 807,560 acres; May 21, White River Forest Reserve (Colorado), reduction of 259,040 acres, leaving present area 970,880 acres. The total combined area of the forest reserves is at present approximately 62,700,000 acres.

Examination of Forests. Thus far in the season Mr. Henry Gannett, geographer of the U. S. Geological Survey, has ordered only two parties into the field for the examination of forests and the classification of lands.

One party, consisting of Messrs. Fred G. Plummer and M. G. Gowsell, is examining the Santa Barbara Reserve, in California. On completing that work they will turn their attention to the mountains in the neighborhood of San Luis Obispo, in the same state. The second party, under Mr. T. F. Rixon, is examining the mountains southwest of Albuquerque, New Mexico. This land has been reserved, and the examination is made in order to determine whether it would be advisable to create there a forest reserve.

Kansas Horticultural Society Meeting.

Nearly all of the papers announced in our last issue as being on the program for the Kansas State Horticultural Society's meeting at Dodge City, on May 11 and 12, were presented, and many good points concerning forest growing in western Kansas were developed in a most successful meeting. A committee was appointed to recommend plans aiding the Bureau of Forestry in Kansas and increasing the efficiency of the state forestry work. This committee is to report at the annual meeting of the society next December, and it is hoped that its report will eventually lead to much more effective forest work by the state, as well as more active cooperation with the Bureau of Forestry.

Forest Reserve Personals.

Mr. Charles McNaughton has reëntered the Forest Service as a ranger on the Gila River Forest Reserve.

Head Ranger Charles H. Shinn has been promoted to forest supervisor and placed in immediate charge of the field work of the northern division of the Sierra Forest Reserve.

Forest Ranger Roger S. Baldwin, who has been attending the Yale Forest School, has resumed his duties on the eastern division of the Santa Barbara Forest Reserve.

James H. Clarke, of Denver, Colorado, has been appointed forest supervisor of the Pike's Peak group of forest reserves of Colorado, to fill the vacancy caused by the death of former Supervisor Michelsen.

James G. Thain, of Montana, has been appointed forest supervisor of the Highwood Mountains Forest Reserve, Montana, with headquarters at Highwood, Montana.

Mr. A. M. Bliss, of Montana, has been appointed forest supervisor of the southern division of the Lewis and Clarke Forest Reserve.

Mr. Adolph Aschoff, who has been serving as first-class ranger on the northern division of the Cascade Range Forest Reserve, has been promoted to forest supervisor of this division, to take effect June 1.

Milton J. Anderson, of the same reserve, has been promoted to first-class ranger.

Mr. Charles A. Ballinger has been appointed forest ranger, to serve on the Cave Hills Forest Reserve in South Dakota, under Supt. Seth Bullock.

Forest Ranger L. T. Mazzanovich has been transferred from the Yellowstone Reserve, Wyoming, to the High River Forest Reserve in Montana.

Special Forest Supervisor A. A. Anderson, who is in charge of the Yellowstone Forest Reserve, has returned to Wyoming to engage in active field duties.

Forest Ranger G. B. Coleman, who has been acting as officer in charge of the western division of the Washington Forest Reserve, has been promoted to forest supervisor of this division, to fill the vacancy caused by the resignation of Mr. R. S. Lambert.

Forest Ranger George W. Millham, who has been employed as forest ranger on the eastern division of the Washington Forest Reserve for the past four years and recently acting as officer in charge thereof, has been promoted to forest supervisor, to fill the vacancy caused by the death of Forest Supervisor P. H. Farley.

Mr. H. D. Langille has been reinstated forest inspector, and is now in the field.

Mr. George H. Barney has been appointed forest superintendent of the recently created Aquaris Forest Reserve of Utah, with headquarters at Escalante.

Samuel S. Terrel has been appointed forest supervisor of the Baker City Forest Reserve in Oregon.

Warning to Homeseekers. An organized band of swindlers is actively at work in several western states, notably Utah, North and South Dakota, and also operating to a lesser extent in the East. These sharpers have selected as easy victims prospective homeseekers who are greatly interested in the various reclamation projects undertaken by the government.

By means of advertisements cleverly worded, in which they claim to have secured inside information regarding the plans of the engineers, and by the display of alleged copies of government maps and surveys, they have been successful in duping many unwary homeseekers. For a consideration of from $50 to $200, these swindlers guarantee to locate settlers upon the best irrigable lands under the government works.

Notwithstanding that the government some time ago issued a circular warning the people against being taken in by just such frauds, the swindling goes right along, and the sharks are reaping a rich harvest. It should be clearly understood that these sharpers have no inside information. Their maps are mere township plats, or rough drafts, such as can be obtained from the land office. The swindlers have no data other than any intending settler can obtain upon request of the Department.

The lands under these government projects are withdrawn from all entry excepting homestead before any actual work of construction is ordered, and the Secretary is by law required to outline the size and location of each farm. Until the plans are completed for construction and the contract has been let for the works, it is impossible to state with any degree of accuracy what the cost of the water will be or what lands will be irrigated. Settlers who make filings based on the information received from these swindlers will not only lose the money paid out, but are liable later to find the lands are not included in the government's proposed system, and thus will have exhausted their homestead entry upon worthless land. When the proper time comes for throwing open to homestead entry the lands under these great irrigation projects, the Secretary of the Interior will give due notice through the public press. Until such announcement, it will not be safe for settlers to locate upon these lands.

Study of Water Laws. The Reclamation Service has recently received from various officials of the Western States sets of law books giving the statutes relating to the appropriation and use of water. Special studies are being made of these subjects in connection with the requirement of the reclamation law, that the work of reclaiming the arid West shall be carried on in conformity with state laws.

The legal experts of the government are devoting particular attention to the questions of law, and are advising state officials, where necessary, of conditions which may interfere with the execution of various contemplated projects.

In the States of Oregon and Washington commissions have been appointed to study the water laws, and the officials of the Reclamation Service have been invited to confer with these commissions and suggest legislation of value in the development of the state.

To Utilize Grand River. The recent withdrawal from entry by the Secretary of the Interior of a large body of land in Colorado marks a very important step in the development of the irrigation possibilities of the Colorado River. The withdrawn areas embrace what is known as the Kremmling reservoir site in the canyon of the Grand River, the largest tributary of the Colorado.

The government engineers, finding it impossible to provide storage in the lower reaches of the Colorado for the extensive systems of irrigation they have planned, have investigated the valleys of the principal tributaries and decided upon the Kremmling as the most valuable site available. This investigation and the withdrawal which followed are only an indication of the far-sighted and practical policy which characterizes the government work of reclamation. These works are not be-

ing built for a single generation, but for all time, and every step taken is carefully considered.

The knowledge that a vast storage reservoir is to be constructed at the headwaters of the Colorado River will relieve much of the apprehension that now exists in the lower valley regarding the proposed diversion of this stream upon lands above Yuma. It will also simplify in a large measure many vexing questions which might arise between Mexico and this country over the division of the water.

A board of six consulting engineers, with Mr. J. B. Lippincott, supervising engineer of the work on the Colorado, and Mr. E. T. Perkins, engineer in charge on the ground, recently made a thorough study of the results of the surveys and investigations in the lower valley. As a result of their determination that the proper storage could not beobtained on the lower Colorado River, the recommendation for the withdrawal of the Kremmling reservoir site was made to the Secretary.

The area which can be irrigated by the proposed government works is estimated at about 2,000,000 acres. These lands are not only unusually fertile, but on account of the climate will produce crops during practically the entire year. The climate and physical characteristics of the river and the features upon which irrigation will depend partake largely of the nature of the Nile in Egypt, involving much the same problems and returning much the same products.

For the successful completion of these works the normal flow of the stream must be supplemented in midsummer by storage, for without storage of water it would not be possible to irrigate more than one-fourth to one-third of the amount of land that can be supplied with proper storage facilities.

Difficult Reclamation Problem. The Farmers' Coöperative Irrigation Association, an organization of certain farmers of Crook county, Oregon, has sent a petition to the Secretary of the Interior bearing 300 signatures and asking that a thorough investigation be made by the reclamation engineers of the irrigation possibilities in that section of the state.

Senator Mitchell has interested himself in the matter, and has urged upon the Department an early investigation of this section. The location of the proposed work has been studied in a general way by the engineers of the Reclamation Service, and the situation has been found to be complicated by the fact that the water supply must apparently be obtained either from Crooked River, the summer flow of which is practically all appropriated, or from Deschutes River, the water supply from which must be carried across Crooked River valley at great expense.

It has been found that the lands which may be watered from Deschutes River have to a large extent been selected by the State of Oregon, and will require the greater part, if not all, of the flow of the Deschutes. The question of water rights, therefore, is a very serious one, and under the circumstances the Reclamation Service does not think it practicable for the government to go into this region while the state is attempting to reclaim large tracts under the operation of the Carey Act, or before it is definitely known what action will be taken under the contracts made with the state for the reclamation of lands along the Deschutes River.

Inyo County, California. In Inyo county, California, on the eastern slope of the Sierras, is a large area of desert public land which bears a strong resemblance to several districts in southern California. The United States Geological Survey is preparing to send a competent geologist to investigate this region with a view to the discovery of artesian water.

Mr. Willis T. Lee, now in Arizona, will probably commence an investigation early in the summer, and will publish a report on the geologic conditions of Inyo county.

MR. A. L. FELLOWS,

ONE OF THE LEADING ENGINEERS OF THE UNITED STATES RECLAMATION SERVICE.

AMONG the men who are doing notable work in the Reclamation Service is Mr. A. L. Fellows, of Denver. While he is deeply interested in the work generally, he has made a special study of irrigation conditions in Colorado, and his efforts in connection with the Uncompahgre project have done much to bring it to favorable notice. One of the most perilous and valuable pieces of exploration work done by the Geological Survey in recent years was Mr. Fellows' reconnaissance of the Grand Canyon of the Gunnison River. This undertaking made possible the present plans for the Gunnison tunnel.

Mr. Fellows was born in Kennebunk, Maine, November 1, 1864, and was educated at Yale University, where he received the degree of B. A. in 1886; commenced work in irrigation lines September, 1887, continuing for eight years in the service of the Montezuma Valley irrigation companies, and being for several years of this period superintendent of schools and county surveyor of Montezuma county, Colorado. He was also for five years deputy state engineer of Colorado. Prior to appointment as an engineer in the Reclamation Service, on January 1, 1903, he was employed at various times by the United States Geological Survey as hydrographer and topographer. Mr. Fellows is author of several papers and articles on hydrography, irrigation survey, and irrigation practice.

WILDERNESS RESERVES.*

BY

PRESIDENT ROOSEVELT.

PART I.

NOTE.—This article, with its accompanying illustrations, forms a part of the fourth and latest volume of the Books of the Boone and Crocket Club, and is reprinted here through the courtesy of the editor, Mr. George Bird Grinnell. In addition to being a remarkably entertaining sketch of wild-animal life in the United States, it is valuable as giving President Roosevelt's view of the purpose of our national parks and forest reserves. To those of our readers unacquainted with the Boone and Crocket Club, it may be well to say that its organization was due to a suggestion by Theodore Roosevelt at a dinner given by him to a few of his friends in New York in 1887—men who were also big-game hunters. The club is made up of men who use the rifle in big-game hunting, and who meet from time to time to discuss subjects of interest to hunters. In addition, the Boone and Crocket Club takes a keen interest in the preservation of the big game of the United States, and has brought about notable improvements and additions to our game laws. Mr. Roosevelt was the first president of the club, and was for many years on its editorial committee.—EDITOR.

THE practical common sense of the American people has been in no way made more evident during the last few years than by the creation and use of a series of large land reserves—situated, for the most part, on the great plains and among the mountains of the West—intended to keep the forests from destruction, and therefore to conserve the water supply. These reserves are created purely for economic purposes. The semi-arid regions can only support a reasonable population under conditions of the strictest economy and wisdom in the use of the water supply, and, in addition to their other economic uses, the forests are indispensably necessary for the preservation of the water supply and for rendering possible its useful distribution throughout the proper seasons. In addition, however, to the economic use of the wilderness by preserving it for such purposes where it is unsuited for agricultural uses, it is wise here and there to keep selected portions of it—of course only those portions unfit for settlement—in a state of nature, not merely for the sake of preserving the forests and the water, but for the sake of preserving all its beauties and wonders unspoiled by greedy and shortsighted vandalism. These beauties and wonders include animate as well as inanimate objects.

The wild creatures of the wilderness add to it by their presence a charm which it can acquire in no other way. On every ground it is well for our nation to preserve, not only for the sake of this generation, but above all for the sake of those who come after us, representatives of the stately and beautiful haunters of the wilds which were once found throughout our great forests, over the vast, lonely plains, and on the high mountain ranges, but which are now on the point of vanishing save where they are protected in natural breeding grounds and nurseries. The work of preservation must be carried on in such a way as to make it evident that we are working in the interest of the people as a whole, not in the interest of any particular class, and that the people benefited beyond all others are those who dwell nearest to the regions in which the reserves are placed. The movement for the preservation by the nation of sections of the wilderness as national playgrounds is essentially a democratic movement in the interest of all our people.

On April 8, 1903, John Burroughs and I reached the Yellowstone Park, and were met by Major John Pitcher, of the regular army, the superintendent of the park. The Major and I forthwith took horses, he telling me that he could show

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me a good deal of game while riding up to his house at the Mammoth Hot Springs. Hardly had we left the little town of Gardiner and gotten within the limits of the park before we saw prong-buck. There was a band of at least a hundred feeding some distance from the road. We rode leisurely toward them. They were tame compared to their kindred in the unprotected places; that is, it was easy to ride within fair rifle range of them; but they were not familiar in the sense that we afterwards found the stone and in the plains south of the Golden Gate. While migrating they go over the mountains and through forests if the occasion demands. Although there are plenty of coyotes in the park, there are no big wolves, and, save for very infrequent poachers, the only enemy of the antelope, as indeed the only enemy of all the game, is the cougar.

Cougars, known in the park as elsewhere through the West as "mountain lions," are plentiful, having increased in numbers in recent years.

PRESIDENT ROOSEVELT AND MAJOR PITCHER.

bighorn and the deer to be familiar. During the two hours following my entry into the park we rode around the plains and lower slopes of the foothills in the neighborhood of the mouth of the Gardiner, and we saw several hundred—probably a thousand all told—of these antelope. Major Pitcher informed me that all the prong-horns in the park wintered in this neighborhood. Toward the end of April or the first of May they migrate back to their summering homes in the open valleys along the Yellow-

Except in the neighborhood of the Gardiner River—that is, within a few miles of Mammoth Hot Springs—I found them feeding on elk, which in the park far outnumber all the other game put together, being so numerous that the ravages of the cougars are of no real damage to the herds. But in the neighborhood of the Mammoth Hot Springs the cougars are noxious because of the antelope, mountain sheep, and deer which they kill, and the superintendent has imported some hounds with which to

hunt them. These hounds are managed by Buffalo Jones, a famous old plainsman, who is now in the park taking care of the buffalo. On this first day of my visit to the park I came across the carcasses of a deer and of an antelope which the cougars had killed. On the great plains cougars rarely get antelope but here the country is broken, so that the big cats can make their stalks under favorable circumstances. To deer and mountain sheep the cougar is a most dangerous enemy—much more so than the wolf.

The antelope we saw were usually in bands of from twenty to one hundred and fifty, and they traveled strung out almost in single file, though those in the rear would sometimes bunch up. I did not try to stalk them, but got as near them as I could on horseback. The closest approach I was able to make was to within about eighty yards of two which were by themselves—I think a doe and a last year's fawn. As I was riding up to them, although they looked suspiciously at me, one actually lay down. When I was passing them at about eighty yards distance the big one became nervous, gave a sudden jump, and away the two went at full speed.

Why the prong-bucks were so comparatively shy I do not know, for right on the ground with them we came upon deer, and in the immediate neighborhood mountain sheep, which were absurdly tame. The mountain sheep were nineteen in number, for the most part does and yearlings, with a couple of three-year-old rams, but not a single big fellow, for the big fellows at this season are off by themselves, singly or in little bunches, high up in the mountains. The band I saw was tame to a degree matched by but few domestic animals.

They were feeding on the brink of a steep washout at the upper edge of one of the benches on the mountain side, just below where the abrupt slope began. They were alongside a little gully with sheer walls. I rode my horse to within forty yards of them, one of them occasionally looking up and at once continuing to feed. Then they moved slowly off and leisurely crossed the gully to the other side. I dismounted, walked

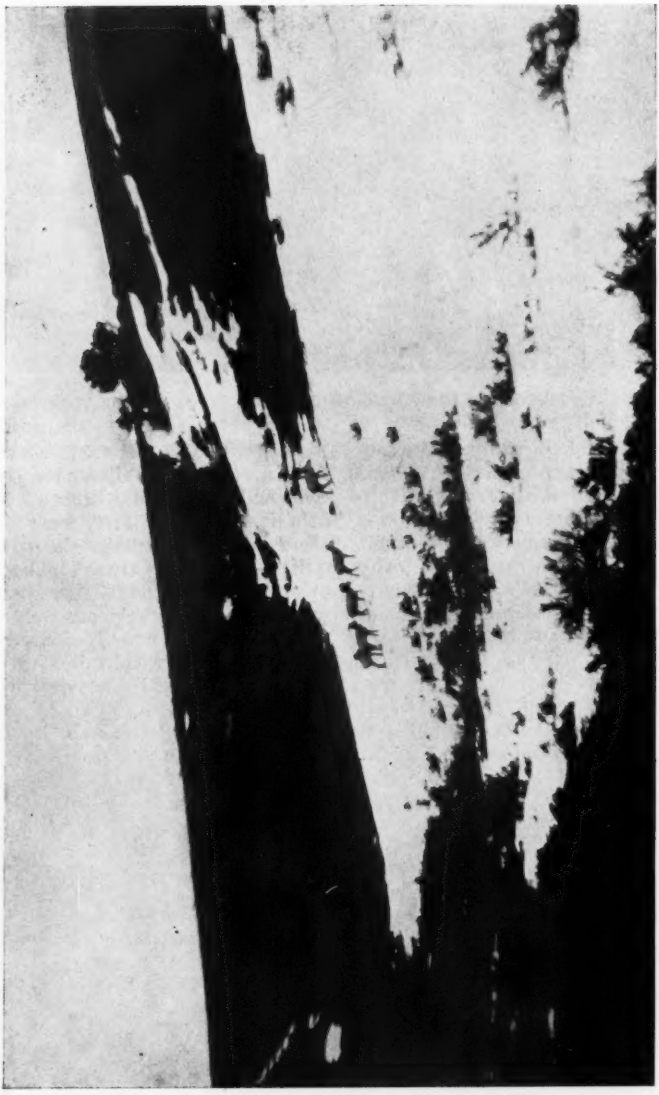
"OOM JOHN" (JOHN BURROUGHS).

PRONGBUCKS.

around the head of the gully, and, moving cautiously, but in plain sight, came closer and closer until I was within twenty yards, where I sat down on a stone and spent certainly twenty minutes looking at them. They paid hardly any attention whatever to my presence—certainly no more than well-treated domestic creatures would pay. One of the rams rose on his hind legs, leaning his fore-hoofs against a little pine tree, and browsed the ends of the budding branches. The others grazed on the short grass and herbage or lay down and rested, two of the yearlings several times playfully butting at one another. Now and then one would glance in my direction without the slightest sign of fear, barely even of curiosity. I have no question whatever but that with a little patience this particular band could be made to feed out of a man's hand. Major Pitcher intends during the coming winter to feed them alfalfa, for game animals of several kinds have become so plentiful in the neighborhood of the Hot Springs and the Major has become so interested in them that he wishes to do something toward feeding them during the severe winter. After I had looked at the sheep to my heart's content I walked back to my horse, my departure arousing as little interest as my advent.

Soon after leaving them we began to come across black-tailed deer, singly, in twos and threes, and in small bunches of a dozen or so. They were almost as tame as the mountain sheep, but not quite—that is, they always looked alertly at me, and though if I stayed still they would graze they kept a watch over my movements and usually moved slowly off when I got within less than forty yards of them. Up to that distance, whether on foot or on horseback, they paid but little heed to me, and on several occasions they allowed me to come much closer. Like the bighorn, the black-tails at this time were grazing, not browsing, but I occasionally saw them nibble some willow buds. During the winter they had been browsing. As we got close to the Hot Springs we came across several white-tail in an open, marshy meadow. They were not quite as tame as the black-tail, although without any difficulty I walked up to within fifty yards of them. Handsome though the black-tail is, the white-tail is the most beautiful of all deer when in motion, because of the springy, bounding grace of its trot and canter and the way it carries its head and white flag aloft.

Before reaching the Mammoth Hot Springs we also saw a number of ducks in the little pools and on the Gardiner.



MOUNTAIN SHEEP.

Some of them were rather shy, others—probably those which, as Major Pitcher informed me, had spent the winter there—were as tame as barn-yard fowls.

Just before reaching the post the Major took me into the big field where Buffalo Jones had some Texas and Flat Head Lake buffalo bulls and cows, which he was tending with solicitous care. The original stock of buffalo in the park have now been reduced to fifteen or twenty individuals, and the intention is to try to mix them with the score of buffalo which have been purchased out of the Flat Head Lake and Texas Panhandle herds. The buffalo were put within a wire fence, which, when it was built, was found to have included both black-tail and white-tail deer. A bull elk was also put in with them at one time, he having met with some accident which made the Major and Buffalo Jones bring him in to doctor him. When he recovered his health he became very cross. Not only would he attack men, but also buffalo, even the old and surly master bull, thumping them savagely with his antlers if they did anything to which he objected.

When I reached the post and dismounted at the Major's house I supposed my experiences with wild beasts for the day were ended, but this was an error. The quarters of the officers and men and the various hotel buildings, stables, residences of the civilian officials, etc., almost completely surrounded the big parade ground at the post, near the middle of which stands the flag-pole, while the gun used for morning and evening salutes is well off to one side. There are large gaps between some of the buildings, and Major Pitcher informed me that throughout the winter he had been leaving alfalfa on the parade ground, and that numbers of black-tail deer had been in the habit of visiting it every day, sometimes as many as seventy being on the parade ground at once. As springtime came on the numbers diminished. However, in mid-afternoon, while I was writing in my room in Major Pitcher's house, on looking out of the window I saw five deer on the parade ground. They were as tame as so many Alderney cows, and when I walked out I got up to within twenty yards of them without difficulty. It was most amusing to see them as the time approached for the sunset gun to be fired. The notes of the trumpeter attracted their attention at once. They all looked at him eagerly. One then resumed feeding, and paid no attention whatever either to the bugle, the gun, or the flag. The other four, however, watched the preparations for firing the gun with an intent gaze, and at the sound of the report gave two or three jumps, then, instantly wheeling, looked up at the flag as it came down. This they seemed to regard as something rather more suspicious than the gun, and they remained very much on the alert until the ceremony was over. Once it was finished, they resumed feeding as if nothing had happened. Before it was dark they trotted away from the parade ground back to the mountains.

The next day we rode off to the Yellowstone River, camping some miles below Cottonwood Creek. It was a very pleasant camp. Major Pitcher, an old friend, had a first-class pack train, so that we were as comfortable as possible, and on such a trip there could be no pleasanter or more interesting companion than John Burroughs—"Oom John," as we soon grew to call him. Where our tents were pitched the bottom of the valley was narrow, the mountains rising steep and cliff-broken on either side. There were quite a number of black-tail in the valley, which were tame and unsuspicious, although not nearly so much so as those in the immediate neighborhood of the Mammoth Hot Springs. One mid-afternoon three of them swam across the river a hundred yards above our camp. But the characteristic animals of the region were the elk—the wapiti. They were certainly more numerous than when I was last through the park, twelve years before.

In the summer the elk spread all over the interior of the park. As winter approaches they divide, some going north and others south. The southern band, which, at a guess, may possibly include ten thousand individuals, winter out of the park, for the most part in Jackson's

Hole—though, of course, here and there within the limits of the park a few elk may spend both winter and summer in an unusually favorable location. It was the members of the northern band that I met. During the winter time they are very stationary, each band staying within a very few miles of the same place, and from their size and the open nature of their habitat it is almost as easy to count them as if they were cattle. From a spur of Bison Peak, one day, Major Pitcher, the guide Elwood Hofer, John Burroughs, and I spent about four hours with the glasses counting and estimating the different herds within sight. After most careful work and cautious reduction of estimates in each case to the minimum the truth would permit, we reckoned three thousand head of elk, all lying or feeding and all in sight at the same time. An estimate of some fifteen thousand for the number of elk in these northern bands can not be far wrong. These bands do not go out of the park at all, but winter just within its northern boundary. At the time when we saw them the snow had vanished from the bottom of the valleys and the lower slopes of the mountains, but grew into continuous sheets further up their sides. The elk were for the most part found up on the snow slopes, occasionally singly or in small gangs; more often in bands of from fifty to a couple of hundred. The larger bulls were highest up the mountains and generally in small troops by themselves, although occasionally one or two would be found associating with a big herd of cows, yearlings, and two-year-olds. Many of the bulls had shed their antlers; many had not. During the winter the elk had evidently done much browsing, but at this time they were grazing almost exclusively, and seemed by preference to seek out the patches of old grass which were last left bare by the retreating snow. The bands moved about very little, and if one were seen

DEER ON THE PARADE GROUND.

WHISKEY JACKS.

one day it was generally possible to find it within a few hundred yards of the same spot the next day, and certainly not more than a mile or two off. There were severe frosts at night, and occasionally light flurries of snow; but the hardy beasts evidently cared nothing for any but heavy storms, and seemed to prefer to lie in the snow rather than upon the open ground. They fed at irregular hours throughout the day, just like cattle; one band might be lying down while another was feeding. While traveling they usually went almost in single file. Evidently the winter had weakened them, and they were not in condition for running, for on the one or two occasions when I wanted to see them close up I ran right into them on horseback, both on level plains and going up hill along the sides of rather steep mountains. One band in particular I practically rounded up for John Burroughs, finally getting them to stand in a huddle while he and I sat on our horses less than fifty yards off. After they had run a little distance they opened their mouths wide and showed evident signs of distress.

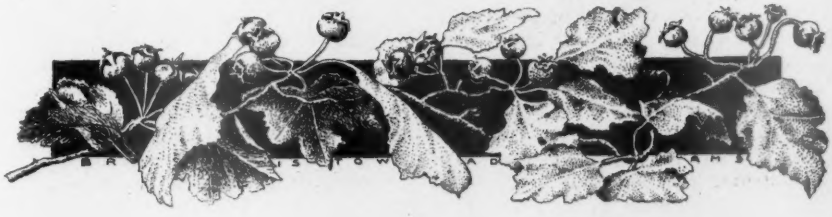
We came across a good many carcasses. Two, a bull and a cow, had died from scab. Over half the remainder had evidently perished from cold or starvation. The others, including a bull, three cows, and a score of yearlings, had been killed by cougars. In the park the cougar is at present their only animal foe. The cougars were preying on nothing but elk in the Yellowstone Valley, and kept hanging about the neighborhood of the big bands. Evidently they usually selected some outlying yearling, stalked it as it lay or as it fed, and seized it by the head and throat. The bull which they killed was in a little open valley by himself, many miles from any other elk. The cougar which killed it, judging from its tracks, was a very large male. As the elk were evidently rather too numerous for the feed, I do not think the cougars were doing any damage.

WAPITI IN DEEP SNOW.

Coyotes are plentiful, but the elk evidently have no dread of them. One day I crawled up to within fifty yards of a band of elk lying down. A coyote was walking about among them, and beyond an occasional look they paid no heed to him. He did not venture to go within fifteen or twenty paces of any one of them. In fact, except the cougar, I saw but one living thing attempt to molest the elk. This was a golden eagle. We saw several of these great birds. On one occasion we had ridden out to the foot of a great sloping mountain side, dotted over with bands and strings of elk amounting in the aggregate probably to a thousand head. Most of the bands were above the snow line—some appearing away back toward the ridge crests, and looking as small as mice. There was one band well below the snow line, and toward this we rode. While the elk were not shy or wary, in the sense that a hunter would use the words, they were by no means as familiar as the deer; and this particular band of elk, some twenty or thirty in all, watched us with interest as we approached. When we were still half a mile off they suddenly started to run toward us, evidently frightened by something. They ran quartering, and when about four hundred yards away we saw that an eagle was after them. Soon it swooped, and a yearling in the rear, weakly, and probably frightened by the swoop, turned a complete somersault, and when it recovered its feet, stood still. The great bird followed the rest of the band across a little ridge, beyond which they disappeared. Then it returned, soaring high in the heavens, and after two or three wide circles, swooped down at the solitary yearling, its legs hanging down. We halted at two hundred yards to see the end. But the eagle could not quite make up its mind to attack. Twice it hovered within a foot or two of the yearling's head—again flew off and again returned. Finally the yearling trotted off after the rest of the band, and the eagle returned to the upper air. Later we found the carcass of a yearling, with two eagles, not to mention ravens and magpies, feeding on it; but I could not tell whether they had themselves killed the yearling or not.

Here and there in the region where the elk were abundant we came upon horses which for some reason had been left out through the winter. They were much wilder than the elk. Evidently the Yellowstone Park is a natural nursery and breeding ground of the elk, which here, as said above, far outnumber all the other game put together. In the winter, if they can not get to open water, they eat snow; but in several places where there had been springs which kept open all winter, we could see by the tracks they had been regularly used by bands of elk. The men working at the new road along the face of the cliffs beside the Yellowstone River near Tower Falls informed me that in October enormous droves of elk coming from the interior of the park and traveling northward to the lower lands had crossed the Yellowstone just above Tower Falls. Judging from their description, the elk had crossed by thousands in an uninterrupted stream, the passage taking many hours. In fact nowadays these Yellowstone elk are, with the exception of the Arctic caribou, the only American game which at times travel in immense droves like the buffalo of the old days.

To be concluded in July number.



TWO YEARS OF RECLAMATION WORK.

SECOND ANNIVERSARY OF PASSING OF THE RECLAMATION LAW IN JUNE—WORK HAS PROGRESSED RAPIDLY—A HIGHLY EFFICIENT ENGINEERING BODY HAS BEEN ORGANIZED—SUMMARY OF PROJECTS AND APPORTIONMENT OF FUND.

THE 17th of June is a day celebrated in American history, and it has an added meaning to people of the West, for upon that date, in the year 1902, President Roosevelt signed the Reclamation Act, initiating the great government work of reclaiming the arid lands of the West.

June 17, 1904, is the second anniversary of the Reclamation Service. Starting with a small group of engineers who had been engaged for years in studying the opportunities of reclamation, it has rapidly expanded within this short time to a large, well balanced engineering corps that is the equal of any in the world. This has been done by drawing experienced men from all parts of the country, and particularly by grouping together those who have had practical experience in the construction of irrigation systems. The expansion of the work, though rapid, has been carried on with great caution. Every man has been considered and has been selected after competitive examination and full approval as to mental and physical qualifications.

At the outset fears were expressed that the reclamation law would prove disastrous to all concerned. The principal opponents of the passage of the law were among the wisest of the statesmen of both parties. They prophesied that there would be a sudden influx of political appointees and a carnival of spoilsmen in the distribution of the money. So far these gloomy forebodings have not proved in the least true. Great caution has been displayed in the organization and conduct of the work, and while energy and zeal have been employed, yet each step has been carefully considered by far-seeing engineers and business men.

The Secretary of the Interior has guarded every point from attack from the outside. He has said in effect to his trusted agents, "Perform this work carefully and as rapidly as is consistent with business caution, and I will see that you are protected from outside pressure for places or spoils." He has committed to Mr. Charles D. Walcott, the Director of the Geological Survey, the larger aspect of the work, and has approved all of the important recommendations made by him.

Mr. Walcott, in the thorough and active way in which he has directed the Survey, has thrown himself into the prosecution of this great work. For years he has studied the question, and the passing of the Reclamation Law was but the signal he had been waiting for to set in motion the machinery of what has already proved to be a most competent organization.

The actual field-work of the Reclamation Service he has wisely left entirely to Mr. F. H. Newell, chief engineer, whose long service as head of the Division of Hydrography has given him unusual opportunities for studying the needs of the arid regions of the West. Under Mr. Newell's energetic lead the field-work has gone forward vigorously, with the result that today, two years from the passage of the Reclamation Law, fourteen highly important projects have been approved and funds apportioned for their construction. At this time a summary of the various reclamation projects being undertaken by the federal government will be of interest.

An apportionment of $27,000,000 of the reclamation fund for the construction of fourteen irrigation projects in the arid West has been decided upon by the Secretary of the Interior, who has approved the plans of the engineers for works in the following states: Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

Actual construction has already begun on the Salt River project in Arizona and on the Truckee project in Nevada. Each of these projects involves a constructive cost of $3,000,000.

UNCOMPAHGRE PROJECT, COLORADO.

The sum of $2,500,000 is reserved for the completion of the Uncompahgre project. This project is located in Montrose and Delta counties, in western Colorado, on the west side of the main range of the Rocky Mountains. The source of water supply is the Gunnison River, from which it is expected that water will be taken by means of a tunnel about 6 miles in length, beginning in the Grand Canyon of the Gunnison and serving water in Uncompahgre Valley, a few miles northeast of the town of Montrose.

The Uncompahgre River flows through a broad, fertile valley, but its flow is quite inadequate for the irrigable lands. The Gunnison River, flowing through one of the most remarkable canyons in this country, carries a comparatively large volume of water, but little of which can be utilized in its drainage basin. It is proposed to divert a portion of this stream's flow in a tunnel cut through the mountains upon about 100,000 acres of land, a considerable portion of which is in private ownership in small tracts. When complete this will be one of the most remarkable engineering feats in the world.

MINIDOKA PROJECT, IDAHO.

In Idaho the sum of $2,600,000 has been provisionally allotted for the construction of the Minidoka project in the valley of the Snake River. The area to be irrigated is about 120,000 acres. Practically all of the land under this project belongs to the government. It is proposed to divide the lands into tracts of 40 and 80 acres each, thus creating 1,400 new farms, with homes for 7,000 people.

This project contemplates the construction of a dam 50 feet high and 572 feet long, which will convert a canyon on the Snake River into a reservoir 35 miles long. Gravity canals run on each side of the river will cover 68,000 acres. In addition to this, 17,000-horse power will be developed at the dam, which will be used for pumping a supply of water to irrigate about 53,000 acres of land lying above the gravity canals. Fifteen huge pumps, each having a capacity of about 110 second feet, or 50,000 gallons, a minute, will be installed.

YUMA PROJECT, CALIFORNIA.

For California the Secretary has set aside $3,000,000 for the construction of an irrigation work on the Colorado River above Yuma. The irrigable lands in the Colorado basin consist almost entirely of long, narrow valleys, ranging from 5 to 10 feet in elevation above the stream in low water. A high percentage of these lands is inundated by the annual rise of the river, which occurs about July 1. The stream bed is of a shifting nature.

The general program for irrigation development along this stream is to be the irrigation of the valley lands in the immediate vicinity of the river in the territory of the United States. There are two reasons for this plan: First, the length of the canal line to reach these lands will be at a minimum, and, second, probably one-half the water applied for irrigation on these lands will return by seepage to the river, to be available for use above.

Extensive examinations for bed rock have been made along the stream, but no satisfactory bed rock has been found at any point. Any storage on the Colorado, as far as now known, will have to be accomplished in the upper reaches of the stream, and explorations are now being carried on in Colorado and Utah with this in view.

The September water supply is sufficient to irrigate 520,000 acres of land. There are 300,000 acres of land in the bottoms above the Yuma project and 400,000 acres including the Yuma project. Assuming that 50 per cent of this water returns from the 300,000 acres irrigated, there would be sufficient water for the irrigation of about 670,000 acres of land. The bottom lands in the valley of the Colorado River in the United States aggregate about 400,000 acres.

Levee surveys are being made to study the overflow problems near Yuma; canals are being located in the field and estimates prepared; diamond borings are being made at Bill Williams dam site; measurements of river flow; evaporation and seepage losses are being carried on in the canals.

MILK RIVER PROJECT, MONTANA.

For the completion of the Milk River project in Montana $1,500,000 has been apportioned. This project in its entirety contemplates the storage in St. Mary Lakes of the flood waters of St. Marys River, a tributary of the Saskatchewan River in Hudson Bay drainage.

The flood waters are to be diverted either through a canal to Milk River, and allowed to flow down that stream through Canada and again be diverted in Montana above the point where it empties into the Missouri River, or by means of a canal connecting with Cut Bank Creek, a tributary of the Marias River, using the latter stream as a natural channel for 50 miles, and again diverting the water through canals upon the valley of the Lower Milk River.

Owing to the international complications which it is feared would arise, the Canadians already being users of the waters of the Milk River, it is probable that the plan of keeping the waters wholly within the United States will be adopted.

Milk River rises in the undulating foothills of the Rocky Mountains near the boundary line of Montana and Canada. Its headwaters flow northeasterly into Canada, and the stream continues for about 100 miles entirely parallel with the international boundary, and then turns southeasterly, passing through the northern part of Montana and emptying into the Missouri River. The valley through which the stream passes is broad and contains many thousands of acres of excellent arid land. The summer flow is not sufficient for the irrigation of any considerable part of this area, and the reinforcement of the supply by utilizing the stored waters of St. Mary Lakes will add greatly to the productive area of this section of the state. It is probable that the first operations of the engineers will be confined to canal construction in the lower valley to utilize the unappropriated flow of the Milk River. About 250,000 acres are involved in the whole project and 68,500 in the first section.

NEBRASKA IRRIGATION PROJECT.

When it was determined that the Sweetwater reservoir probably could not be filled, owing to an inadequate water supply, search was made for other reservoir sites, and one was found on the North Platte River, about 3 miles below the mouth of Sweetwater River. This is at the beginning of the canyon through the Rattlesnake range of mountains. A dam constructed here will be 75 feet in length at the bottom, 200 feet high, and about 250 feet long at the top. Surveys show the superficial area of the reservoir thus created to be about 23,000 acres and the capacity 1,080,000 acre-feet. It is probable that it will hold all the flood and surplus water flowing in the North Platte River to this point. The waters thus stored will be used on lands in eastern Wyoming, in the Goshen Hole region of the North Platte River, and in western Nebraska.

HONDO PROJECT, NEW MEXICO.

The Hondo project in New Mexico is located on Hondo River, a tributary of Pecos River in southeastern New Mexico, about 12 miles southwest from the town of Roswell, in the county of Chaves. The river is torrential in character, and the ordinary summer supply is already appropriated.

It is proposed to construct a reservoir in a depression near the river, divert the storm or flood waters and unappropriated waterflow into the reservoir, and hold it for use during the irrigation season to irrigate lands lying east of the reservoir and south and southwest from Roswell. These lands are adjacent to productive fields near Roswell, and with an assured water supply could be put into cultivation at once. The area to be irrigated under this project embraces about 20,000 acres, and the cost will probably be about $300,000.

FT. BUFORD PROJECT, NORTH DAKOTA.

This project is located on the west or left bank of Yellowstone River, the canal heading near Glendive, Montana. This project involves a canal about 80 miles long and covers 60,000 acres of land in Montana and North Dakota. The cost of the headworks is placed at $72,000, and that of other constructions and excavations $1,375,000, or a total of $1,650,000, an average cost per acre of $25.

MALHEUR PROJECT, OREGON.

This project contemplates the reclamation of land in eastern Oregon near Snake River, in the vicinity of the towns of Vale and Ontario. The irrigable tracts include about 40,000 acres of good bench land lying on the north and south sides of Malheur River. Two reservoir sites of sufficient capacity to retain all the flood waters have been found on the stream and have been surveyed.

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

This project involves the reclamation of lands in the northeastern part of the Black Hills, in Butte and Meade counties, South Dakota, by the diversion of the waters of Belle Fourche River and the storage of its flood water in basins east of the town of Belle Fourche. These basins are to be converted into storage reservoirs by the construction of embankments of earth closing their outlets. From the reservoirs, which are filled by a large feeder canal from the river, the water will be distributed to lands in the Belle Fourche Valley, where it is thought at least 90,000 acres may be reclaimed, about one-half of which is in public ownership. Power has also been developed at the Dry Creek reservoir and employed to elevate water to Upper Indian Creek flat, where some 15,000 acres of land are located, nearly all in public ownership.

The reclamation works, it is estimated, will cost about $1,230,000.

UTAH LAKE PROJECT, UTAH.

Utah Lake is in effect a large storage reservoir, catching the mountain flow and delivering it into the canals. Unfortunately, however, the lake is too large for effective use, and the losses by evaporation are far in excess of the amount put to beneficial use. An extension of irrigation in Salt River Valley is dependent upon the ability to reduce the loss by evaporation, and to handle Utah Lake more effectively.

The lands which will probably be included in this project are probably all in private ownership, and comprise an area of about 70,000 acres. The entire bed of Utah Lake, covering 140,000 square miles, has been contoured at intervals of one foot, and all the principal streams flowing into the lake have been systematically measured at the flood season and at low water.

One million dollars have been set aside for this project.

BIG BEND PROJECT, WASHINGTON.

This project contemplates the reclamation of a large body of land surrounded partly by the Columbia River, which flows along the northerly and westerly sides. The lands in 154 townships have been withdrawn from entry pending an investigation of this project.

A number of reservoirs in connection with this project has been discovered and all public lands within their area withdrawn from entry for reservoir purposes. Considered as a whole, the Big Bend project embraces the largest area of irrigable land of any project under consideration by the government. The Secretary has set aside $1,150,000 for the continuance of the work on this project.

CODY PROJECT, WYOMING.

This project contemplates the reclamation of land on the north side of Shoshone River, in the town of Cody, in Bighorn county. The irrigable land extends along the river for a distance of about 40 miles and comprises approximately 93,000 acres, most of it being high-grade agricultural land. In addition to this land, about 9,000 acres on the south side of the river may be reclaimed and several thousand acres more in the drainage area of Clark Fork. All of the land lies at an elevation of from 4,150 to 5,150 feet above

sea level. Shoshone River discharges a relatively large amount of water, and its summer flow has not been entirely appropriated. Six miles above the town of Cody the river enters a canyon cut through solid granite for a distance of one and a half miles. At the upper end of this canyon it is proposed to construct a dam of uncoursed masonry. The dimensions of the dam will be—height, 170 feet; length on bottom, 65 feet, and length on top, 150 feet. This dam will form a reservoir in the basin above the canyon with a capacity of 159,500 acre-feet. The stored water will be used to reinforce the summer flow. The estimated cost of this project is $2,250,000.

PLANTING WHITE PINE.

INVESTIGATIONS BY THE BUREAU OF FORESTRY PROVE IT TO BE COMMERCIALLY FEASIBLE IN NEW ENGLAND.*

IT has often been held that plantations of white pine can not be made profitable. Contentions have constantly arisen to the effect that the first cost, taxes, and interest on the investment are enough to eat up all the returns that may be expected from white pine plantations, and that forty years, the time when the first cutting may be profitably made, is too long to wait for the profits involved, should there be any. It is right that all of these things should be taken into consideration, and it would be palpably unwise to undertake a pine plantation on land which could be used to better advantage for general agricultural purposes. In fact, white pine planting in the New England and adjacent states is of most value where a number of uses may be served, as the timber result alone may not be sufficiently profitable to make it wise. In the case of waste lands, however, white pine might just as well be raised as scrub growths, which have no chance of adding value.

Where planting is apt to prove most valuable is on watershed areas in connection with reservoirs, on sand barrens and dunes, on bare soils and worn-out pastures, on cut-over land, and for woodlots. Many of the "abandoned farms" of New England had best be abandoned to a good growth of white pine, even at considerable initial expense.

Boston and other New England cities depend on lakes and reservoirs for their water supply. The better forested the tributary watershed is, the better it is for the water, from the points of view of both quantity and quality, and at Clinton, Mass., 1,500 acres are being planted in white pine and sugar maple, in mixture, for the single purpose of regulating and purifying the water supplied to Boston and other towns, though the question of ultimate lumbering operations is also being taken into consideration. Often the planting will prevent drifting sand from encroaching on valuable property. Again, on bare soils and worn-out pastures, where there is a very slow and unsatisfactory growth of white pine by natural reproduction—the resulting growth being low, branchy, and undesirable—the expense of planting is minimized, and the probable results more satisfactory. Cut-over lands and woodlots may be planted to pine with every expectation of good results, and in the latter the actual results in fuel and timber are not the only ones to be considered. Where they may be utilized as wind-breaks for buildings or orchards they serve a double purpose. Always it is well to keep in mind the dual or triple usefulness of the plantations, and count the profits in more than the single item of sales of timber.

There is ample opportunity to study the question of profits in New England, because during the period between 1820 and 1880 the enthusiasm for white pine planting amounted almost to a fad. Men

* Bulletin No. 45, Bureau of Forestry, Washington, D. C. The Planting of White Pine in New England, by Harold B. Kempton.

PLANTED WHITE PINE 43 YEARS OLD.

foresaw the time when marketable native pine would be gone, and when planted timber would be of economic importance. Then about 1880 the cheap transportation rates from new white pine fields began to put a damper on further planting. But with present conditions there is still reason for a continuation of the planting. Careful surveys have been made of a number of these older plantations in almost all of the New England states and in Pennsylvania and Virginia. Practically all of them have been planted long enough for a definite basis of profit calculation to be established in accordance with the methods used for making the plantation—the first cost, the use of other trees in mixture, and the treatment after planting.

In all cases it must be understood

INTERIOR OF PLANTATION IN EXPOSED SITUATION ON NARRAGANSETT BAY.

that white pine is reproduced from seed, which may be gathered or bought at a comparatively low cost of effort or of money. The percentage of germination is high, and with care a pound of seed, at an average cost of $2.50, will produce about 12,000 seedlings, which will be suitable for transplanting. Only under favorable conditions will it pay to sow broadcast for in-place planting, with thinning afterwards, and local conditions as to the supply of seeds or seedlings should be consulted in every instance. Various methods of collecting the seed

have been resorted to, though the expensive one of cutting down a seed tree is now seldom practiced, save when the tree is ripe for lumber. It is necessary to collect the seed from the tree in order to prevent loss, because the cone opens and throws its seeds before falling from the tree. Seed years occur at irregular intervals of from four to seven years, and, as the seed takes two years to mature, it is possible to predict a seed year twelve months in advance of the crop, and thus have all preparations made for the planting when seed is abundant and fresh. The seed bed should be well prepared, and should preferably be a sandy loam, well drained. The seeds are planted in rows, and the seedling must be protected from too much moisture and too much sun. For these purposes lath or canvas screens are used as shade frames, or, if tilted, will keep out excess of rain. Keeping the tender shoots free from choking weeds is absolutely necessary. From all these preparations it can be seen that there is considerable expense connected with the starting of the plantation. Then there comes transplanting in early spring or late fall, and care after that operation.

A six-foot interval is usual for the transplanted trees. After this, pruning is an important item and must be done carefully, removing the branches to as high as a man can reach, when the trees are about fifteen years old. Later still, thinning will have to be done in many plantations, so that the final stand will be about twelve by twelve feet apart.

Of the mixtures used and their comparative values, it may be said of the common ones that European larch is not particularly advantageous, and that the mixture benefits the larch, but has no good effects for the pine. Oaks are of indifferent value, and white oak, though a valuable tree, is not adapted, owing to its slow growth. Chestnut is excellent, as, when it begins to overtop the pine, it may be profitably cut for posts, poles, or ties after having furnished the necessary shade. Scotch pine has no disadvantages as far as the growth of each species is concerned, but it is of inferior commercial value, and therefore of less account than other species would be. Red pine is subject to the same objections as the larch, and, where a good growth of white pine is the ultimate object, it has many disadvantages. Norway spruce is of value to both trees in mixture, and when the time comes for thinning the spruce is of marketable size. In many ways sugar maple is the best economic mixture of all, for the seedlings may be obtained at less than half the cost of the pine, and there can be planted just enough of the pine for the future stand when the maple is removed.

The age for the profitable lumbering of the pine is about forty years. It is then valuable for boxes at about $4 a cord on the stump, or about $160 per acre. A bulletin prepared by the Bureau of Forestry, which gives a detailed account of several plantations, places the net annual return from planted white pine in New England at $1.15 per acre, paid at the end of forty years, in addition to compound interest at 4 per cent on the money invested.

FOREST THINNING AND ITS RESULTS.

BY

WILLIAM F. HUBBARD,

FIELD ASSISTANT, BUREAU OF FORESTRY.

PART I.

THERE are few forest problems in which a general knowledge of the practice of thinning is not of assistance, and as soon as an intensive forest system becomes practical it is of the greatest importance. The necessity of lessening the fierce struggle in the forest for the survival of the fittest is evident to all who have had any experience in woodcraft, and even in this country a few wood-lot owners have developed ideas on the subject generally without ever hearing of the art of forestry. The value of thinning being apparent in a general way, we find that its origin dates as far back as the history of forestry itself, and that it was one of the first branches of the art to become systematized. As early as the sixteenth century thinnings were planned by a regular method in certain parts of Germany, and from that time they became more and more general in Europe. When forestry became an art, in the latter half of the eighteenth century, the theory and practice of thinning received a large share of attention, and from the beginning of the nineteenth century to the present day there have been definite experiments to determine the increased increment and quality of timber resulting from different methods. Although experiments have covered so wide a period, it is strange that little definite information has appeared until quite recently, and as yet only in the European forest periodicals and experiment station reports. Even the German text-books are lacking in exact data and reports on the subject, while in English there is nothing known to the writer beyond a few general principles. The object of the following two papers is to give the latest results of experiments showing the proper degree of thinning necessary to produce the most lucrative intermediate yield and the best results from the final yield in the shortest time.*

Part I deals with the theory and practice of thinning; Part II will give the results obtained from definite experiments, together with a few notes concerning the adaptation of these to American conditions.

PART I.—THE THEORY AND PRACTICE OF THINNINGS IN EUROPE.

A.—*The Value of Thinning.*

A normal stand of coniferous timber on first-quality soil begins with about 4,000 trees to the acre, but at maturity (100–120 years) there are seldom more than 300 trees, of which only 200 to 150 belong to the final merchantable yield of saw timber. It seems an enormous waste of time and energy to plant such a number and yet have only one-tenth or less of them pay the bulk of the expense and the final profit. Yet there is no other method possible. The object of a forest system is to obtain the greatest amount of timber in merchantable form per given area in the shortest time. If fewer trees are planted to the acre the resulting mature specimens have not the cleanness of shaft and fullness of form necessary for good lumber. If this fact needs proving, a British example may be cited. By the crude methods of forestry in Great Britain the woods are planted wide and heavily thinned, so

* The authorities used are: Manuscript notes from the lectures of Professors Buehler and Lorey at Tuebingen; Ph. Flury in vol. vii, Mitteilungen der Schw. Centralanstalt fuer das Forstl. Versuchsewesen; M. Kunze in Tharandter Forstl. Jahrbuch, vol. 45; Professor Lorey in the Forst and Jagdt Zeitung, and C. Laschke, History of Thinnings.

that the cover is permanently broken. As a result, builders always specify foreign-grown timber in their plans for all but poorest grades, the home-grown stock selling far below the imported.*

Aside from quality, there is also a much greater volume yield per acre by close planting. In a natural forest the yield over a large area seldom exceeds 25,000 feet, yet in Germany for the whole coniferous forest the average stand of merchantable Scotch pine is 42,000 B. F. per acre and for spruce and fir about 77,000 feet.

To understand the conditions which produce such yields from the small per cent of planted trees, the life history of the individuals in the stand must be analyzed. Such a forest usually closes about the sixth year, and from that time on each tree enters into fierce combat with its neighbors for light and room. The struggle soon has its effect on the individuals of the stand, which may then be divided into three broad classes: Dominant, overtopped, and suppressed. Narrower classification separates the dominant class into three, making the division as follows:

I. Decidedly dominant. Trees with exceptionally well-developed crowns.

II. Dominant. Trees with well-developed crowns.

III. Codominant. Trees with fairly normal crowns, but with relatively poor development.

IV. Overtopped.

a. With badly formed crown, but free in one or more directions.

b. Very poor crown, but still free in one direction.

V. Suppressed.

a. Crown still thrifty, but absolutely overtopped.

b. Dying or dead.

As the number per acre falls so suddenly with the development to maturity, it stands to reason that the greatest number of trees and the main increment must be found in the dominant stand. Experiment has proved that the per cent of total increment in the five classes compared with their relative number per given area is as follows:

* Parliamentary Report on British Forestry, 1903.

Spruce 18 to 30 Years Old.

Per cent of total number.		Per cent of total increment.	
I.....	66	I.....	40
II.....		II.....	24
III.....	9	III.....	17
IV.....	7	IV.....	12
V.....	18	V.....	7

As the total number of trees at this age is about 1,650, it is evident that the future merchantable yield will be made up of only a small part of classes I and II, and that the increment of the other trees will be last in the depletion of the stand as it matures.

The main object of the thinning then is two-fold:

1. To use the growth of the intermediate stand, which is not inconsiderable.

2. To shift as much as possible of the total increment on the trees of the final stand by the removal of trees which crowd it, but which can not mature as merchantable trees of desired quality. The following table, the figures of which are taken from various experimental areas, adds clearness to the subject:

Spruce, First Quality.

Age.	Number per acre.	Height in feet.	Volume, cubic feet per acre.
92.....	210	101	15,554
93.....	254	100	15,274
92.....	343	107	18,527
95.....	365	101	16,786
100.....	208	121	19,670
100.....	228	108	15,814
101.....	315	99	16,590

From this it is clear that at maturity 200 trees or so can produce the same volume of merchantable timber as 250 or even 300 trees, and that the difference can be used in the interim without decreasing the final crop; nor does this take into consideration the improved quality and greater value of timber in the final stand. In the preceding table it will be noticed that the best acres for volume show the best development in

height. Any curve of height growth shows a decided falling off after the fortieth year or so, and a method that will stimulate growth during this period is likely to add directly to the yield. This seems to be the case in these instances and adds evidence to the value of thinnings.

To recapitulate, the importance of thinnings lie in the improved quality and quantity of the final yield obtained by the use of timber, which would otherwise go to waste, thus giving an intermediate yield which greatly helps the financial success of the long crop rotation often necessary in forestry. This intermediate yield is an appreciable item in every German forest estate. The average annual intermediate yield of merchantable poles and logs for Würtemberg amounts to 252 cubic feet, for the first-quality class of conifers it is 378 cubic feet, and in special cases it often comes to 840 cubic feet. Other good results of thinning are as follows:

1. The mixture can be regulated and undesirable species removed.

2. The quality of the mixture bettered — decayed, diseased, and badly formed trees removed.

3. The danger of breakage from snow, ice, and storm lessened. By allowing each crown and bole a better development, the cover is made stronger and more resistant to storms.

4. The danger from insects and fire is lessened by the removal of dead and dying timber.

B.—*The Technique of Thinning.*

All systems of thinning are based on a division of the stand into classes similar to those given above. Until quite recently only three degrees were in common use, being designated by the letters A, B, and C, or "light," "medium," and "heavy," the C, or heavy, not breaking the forest cover by more than 2.5 per cent. These grades cut into the stand as follows:

Thinning.	Classes removed.
A.....	V, b and a.
B.....	V, b and a, and IV, b.
C.....	V, b and a, and IV, b and a.

Of late less conservative ideas have come into vogue, and in all recent experiments the division is made into four main grades: A, light; B, medium; C, heavy, and D, very heavy. The classes taken under this system and the per cent of the total stand removed are as follows:

Thinning.	Classes taken out.	Per cent of total number.
A.....	V.....	5–20
B.....	V, IV.....	20–30
C.....	V, IV, III...	30–40
D.....	V, IV, III..... And part of II.....	40–80

A stand of maturing trees falls into two main classes in reference to the future merchantable crop: The *final stand*, out of which the mature trees will be recruited, and the *intermediate stand*, which has fallen behind and will evidently perish before the period of rotation is over. These two divisions vary in composition with the age of the forest. In relation to each other, however, they are constant, the final stand being composed of classes I, II, and III, and the intermediate stand of IV and V. The less radical methods of thinning only attack the intermediate stand, but C and D enter boldly into the recruiting ground of the final crop. Common experience in practice, without experiment, has shown that slight thinning neither gives a very paying intermediate yield, nor greatly improves the growth and quality on the final stand. The value of this method seems clear from the figures given above, which show that the greatest increment and the greatest number of trees are in classes I and II; hence it follows that competition is most severe in this class, and that the greatest volume can be most profitably removed therefrom.

Beside grades C and D many systems of regular thinning in the final stand have been advocated, the most practical and generally used of which is the French method, *éclaircie par le haut*. By this the best trees of the final stand (approximately equal to the number of

the mature crop) are set free on all sides by the removal of all their immediate neighbors which crowd them, irrespective of the class to which they belong. The rest of the stand is thinned by grade A and made to serve as ground cover and keep the selected trees well pruned and full-boled. This may be called "selection thinning," and is designated as D A. It has given good results in practice, the intermediate yield being excellent and the final yield of the best quality and quantity.

The time for the first thinning and the subsequent recurrence depends, like everything else in forestry, on the situation of the forest and the market conditions. Theoretically, they should begin after the cover is established, say in the tenth or twelfth year, and continue in five or ten year intervals throughout the period of greatest growth.

In conclusion, let it be said that a thinning never permanently breaks the forest cover. In the heaviest D thinning the forest should not take longer than three to five years in recovering itself. Of course, the degree of thinning depends entirely on species, age, and soil quality, but any permanent break in cover is a light increment cutting and belongs to a different question.

RECLAMATION WORK IN NEW MEXICO.

DESCRIPTION OF ONE OF THE FIRST PROJECTS LIKELY TO BE TAKEN UP IN THIS TERRITORY.

THE report of Mr. W. M. Reed, Resident Engineer of the Service, is of particular interest by reason of the fact that it is probable the government will begin at an early date the construction of an irrigation work at one of the sites recommended by him. Apparently the most feasible project discovered by Mr. Reed is on the Hondo at a point nearly on the dividing line of the watersheds of Hondo River and the Black Water Arroyo. The reservoir site lies in a large natural depression commonly called a dry lake, and has an area of 1,072 acres, and with no embankment would hold 11,480 acre feet. The bottom of the lake is a heavy alluvial deposit, and borings were satisfactory as to its water-holding properties. The perimeter is nearly all limestone, and has the appearance of being as solid and free from cavities as any limestone formation, except at the places where fills are required. The sides are much higher than the proposed water line and have rock on or near the surface.

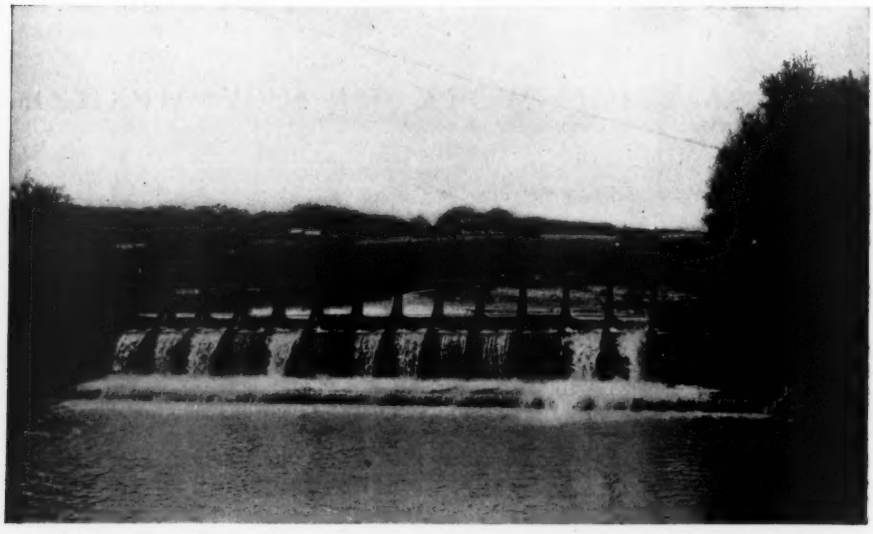
Mr. Reed's plan for diverting the water is to make two canals of sufficient size to carry all the flow of the river, and to provide a spillway on the canal at a rock point 4,000 feet from the river. The river at the point of diversion is in earth, and to provide for a spillway here would be expensive and would be always a source of annoyance if not danger. Two spillways or flushing gates are placed on the canal, each in solid rock, with their grade two feet below the grade of the canal at that point. These spillways are provided with gates, not automatic, for these gates are to be used only when the reservoir is full, or when it is desired to flush the silting basins. The top of the gates will be below the embankment grade, and will act as safety spillways in the case of unexpected and unusual floods.

The canal will have a seventy-foot road bed, and an embankment will be placed at the lower side. The canal will enter the reservoir from a rock cut, thus preventing any erosion. The outlet canal will connect the lowest point in the reservoir site with the original bed of the river. The elevation at these points being the same, the canal is level.

The bed of the Hondo will be used for carrying the irrigating water for a distance of about one mile. At this point it will be turned by a small concrete diversion dam into distributing canals on one side of the river. This point of diversion is not the most suitable from

an engineering standpoint, but up to the present time one of the owners of the flood-water rights, having a ditch just below it, has refused to make any satisfactory proposition toward a settlement with the government in case the reservoir should be constructed, and it was deemed best to locate the canal from the above point to determine what lands would come under irrigation, and to ascertain the cost of the works. Diversion from a point lower down the river would lessen the cost and would bring the same lands under cultivation.

basins at the downstream side a spillway will be placed in the bank of the canal with a bottom grade below that of the canal. At times of heavy rainfall, when water rushes down the arroyos, the spill or flush gates will be opened and the silt removed from the basins. The water passing through these flush gates will spread out over the bottom land and ultimately reach the old bed of the river, and can be sluiced down the river in the same manner that nature has been doing for ages. Except during the flood time the Hondo water carries very little silt,



AN IRRIGATION DAM IN NEW MEXICO.

During floods the Hondo carries a large amount of silt. Engineer Reed proposes the following plan to prevent danger of the reservoir filling from this source: The velocity of the canal is to be governed to such an extent that the heavier silt will be deposited in basins, which are provided by making the alignment of the canal to cross three arroyos near their mouth, where the surface flattens out. Two of these arroyos have a length of five or six miles and drain considerable territory. At the end of the

and therefore during the non-irrigating season, when there is a constant flow in the river, it is advisable to pass the water through the canal and into the reservoir with as little exposure to seepage and evaporation as possible. To be able to do this at one time, and also at other times pass a little body of water through as a slow current, it is proposed to place a removable bulk-heading or gates below the sluiceways, and thus be able to delay or check the current, causing the silt to settle in the basins.

FOREST LEGISLATION IN NEW YORK.

IMPORTANT AMENDMENTS TO THE FIRE LAW—BOUNDARIES OF THE ADIRONDACK AND CATSKILL PARKS DEFINED—PROPOSED AMENDMENT OF CONSTITUTION.

FOREST matters received considerable attention at the latest session of the New York legislature, recently closed. First in importance to the forest interests of the state were the amendments made to the forest fire law, brought about mainly through the terrible conflagrations of the spring of 1903. It would now seem that the protection of the state forests is up to those persons whose business it is to look after them, for the weak points of the fire law have been pretty thoroughly overhauled.

Bills were also passed amending the forest, fish, and game law in regard to defining the boundaries of the Adirondack Park, and to create a Catskill Park and define its boundaries. The general supply bill carried a provision for $250,000 to be used for the purchase of lands for the Adirondack and the Catskill Parks.

The senate and assembly also passed a concurrent resolution which provides for amendment of section seven of article seven of the constitution in so far as necessary to secure the removal of dead timber on burned areas of state lands.

These several measures are of such particular interest to the readers of FORESTRY AND IRRIGATION that the text of each is given here in full.

I.

AN ACT TO AMEND THE FOREST, FISH, AND GAME LAW IN RELATION TO THE PREVENTION OF FOREST FIRES.

SECTION 1. Section two hundred and twenty-four *a* of chapter twenty of the laws of nineteen hundred, entitled "An act for the protection of the forests, fish and game of the state, constituting chapter thirty-one of the general laws," is hereby amended to read as follows:

SEC. 224*a*. Chief fire warden and foresters.—The commission shall appoint a chief fire warden who shall receive an annual salary of fifteen hundred dollars and his necessary traveling expenses, and who shall have supervision of town fire wardens, visit and instruct them in their duties and enforce the law as to fire districts in towns and under the authority of the commission commence prosecutions for violations of laws to prevent forest fires; and may from time to time employ expert foresters (at a total annual compensation not to exceed three thousand dollars) and at a rate not exceeding fifteen hundred dollars a year for any forester. The chief and expert foresters shall hold office during the pleasure of the commission and perform such duties for the preservation of forests as the commission shall prescribe. The commissioner may also appoint five assistant fire wardens, at least four of whom shall during seasons of the year when forest fires occur, serve along lines of steam railroads in the forest preserve counties of the Adirondacks. They shall inspect such railroads and the engines thereon, reporting to the commissioner the condition thereof for purposes of fire prevention, and perform such other duties in preventing forest fires as the chief fire warden or the commissioner shall direct. They shall also have the powers and duties of game protectors, and when not needed as fire wardens may be employed as game protectors or in reforestation, or as the commissioner may direct. They shall each receive an annual salary of six hundred dollars and an allowance for expenses not exceeding four hundred and fifty dollars.

SEC. 2. Said act is hereby amended by adding a section, to be known as two hundred and twenty-four *b*.

SEC. 224*b*. Fire patrol.—Whenever in the judgment of the commissioner it is necessary to protect the forests from fire, he shall organize and as long as necessary maintain a fire patrol along

the lines of railroads in forests in counties containing parts of the forest preserve, and at such other places in such counties as the public interest requires. Such patrol shall be organized and maintained under the chief and assistant fire wardens who shall themselves be placed in charge of sections of the exposed areas as fire patrols. Game protectors may, so far as the public interest will permit, be detailed as additional assistant fire wardens for such patrol under the chief fire warden. The commissioner may also in case of immediate peril from fire, with the consent of the governor, employ temporarily such additional assistants to maintain an efficient fire patrol as the public interest requires. The chief fire warden and assistant fire wardens when engaged in inspection of railroad lines and engines or on fire-patrol duty on railroad lines, as herein provided, shall be transported without charge from point to point as their duties shall require, by the railroad companies on whose lines such fire patrol and inspection are maintained. The commissioner shall keep account of the cost of maintaining any such fire patrol and system of inspection along the line of a railroad in the forest preserve, including therein the salaries, expenses and wages of public officers or employés directly engaged in maintaining such patrol for the time that the said patrol and inspection are maintained, and one-half the cost thereof during the preceding year shall be paid by the railroad company on the first day of December of each year to the commissioner. The commissioner may also organize in any town in the forest preserve a fire patrol during the season when fires occur. One-half the expense thereof shall be a town charge, and one-half shall be paid by the state unless according to the last assessment-roll of such town more than one-half of the landed property therein in value, is the property of the state, in which case the state shall pay such a proportion of the cost of such patrol as the value of the lands held by the state bears to the entire assessed valuation of such town, and the remainder shall be a town charge. If the state pay the whole amount the commissioner may collect the amount payable by any town of such town.

SEC. 3. Section two hundred and twenty-five of this act is hereby amended to read as follows:

SEC. 225. Fire wardens and fire districts.—The commission (shall) may from time to time in every town having lands which are part of the forest preserve, and may in every town having lands which would become part of the forest preserve if acquired by the state, appoint a fire warden who shall act during the pleasure of the commission. When required by the commission, such fire warden shall, and any such fire warden may establish two or more fire districts in his town. He may also by a written appointment filed in the town clerk's office, from time to time appoint a resident citizen in each district as district fire warden who shall act during the pleasure of the fire warden. (Such districts shall be established by filing in the town clerk's office a map showing the boundaries thereof and by posting a duplicate map in a public place in the town. The cost of such maps not exceeding ten dollars shall be a town charge.) In every other town the supervisor shall be fire warden by virtue of his office. If the supervisor be absent when fire occurs, or fail to act, any justice of the peace in the town may act as fire warden. If in a town situated in a county containing lands of the forest preserve, the commission is unable to find a suitable person who will accept the position of fire warden, then the supervisor of that town shall act as fire warden and discharge all the duties devolving on that office by law, and shall promptly make to the chief fire warden a report of each forest fire that occurs in his town.

SEC. 4. Section two hundred and twenty-six of said act is hereby amended to read as follows:

SEC. 226. Duties of fire wardens.—Under the commission a fire warden is charged with preventing and extinguishing forest fires in his town. During a season of drought a fire warden may, with the approval of the commissioner, establish a fire patrol in his town. In

case of fire in or threatening forest or woodland, the district fire warden, if any, or if none, the fire warden shall attend forthwith and use all necessary means to confine and extinguish the same. The fire warden may destroy fences or plow land, or in an emergency, set backfires to check fire. Either the fire warden or a district fire warden may, summon any resident of his town to assist in putting out fires. Any person summoned who is physically able and refuses to assist, shall be liable to a penalty of ten dollars. An action for trespass shall not be against persons crossing or working upon lands of another to extinguish fire. In case a forest fire burn over more than an acre of land, the fire warden of the town in which it occurs shall make a report thereof to the commission, giving the area burned over, the quantity of timber, wood, logs, bark or other forest products, and of fences, bridges, and buildings destroyed with an estimate of the value thereof. He shall also roport the cause of such fire and the means used in putting it out.

SEC. 5. Section two hundred and twenty-eight of said act is hereby amended to read as follows:

SEC. 228. Railroads in forest lands.—Every railroad company shall on such part of its road as passes through forest lands or lands subject to fires from any cause, cut and remove from its right of way along such lands at least twice a year, all grass, brush and other inflammable materials. Where the railroad runs through forest lands in counties containing part of the forest preserve, it shall so cut and remove the same from its right of way whenever required by the commissioner; employ in seasons of drought and before vegetation has revived in the spring, sufficient trackmen to promptly put out fires on its right of way; provide locomotives thereon with (steel) netting of steel or iron wire (on the smokestacks) so constructed as to give the best practicable protection against the escape of fire and sparks from the smokestacks thereof (to prevent the escape of fire and sparks) and adequate devices to prevent the escape of fire from ash pans and furnaces which shall be used (by every engineer and fireman) on such (part of its road) locomotives. The railroad commission must upon the request of the forest, fish and game commissioner, and on notice to the railroad company or companies affected, require any railroad company having a railroad running through forest lands in counties containing parts of the forest preserve, to adopt such devices and precautions against setting fire upon its line in such forest lands as the public interest requires. No railroad company or employé thereof shall deposit fire coals or ashes on its track or right of way near such lands. In case of fire on its own or neighboring lands, the railroad company shall use all practicable means to put it out. Engineers, conductors or trainmen discovering or knowing of fires in fences or other material along or near the right of way of the railroad in such lands, shall report the same at the first station to the station agent, and such station agent shall forthwith notify the nearest fire warden or game protector thereof, and use all necessary means to extinguish the same. (Any railroad company or employé thereof violating any provision of this section shall be liable to a penalty of one hundred dollars for every such violation.) Any railroad company failing or neglecting to comply with any of the provisions of this section, or any order of the railroad commission made pursuant to the provisions of this section, shall be liable to a penalty of one hundred dollars for each day that it continues a violation thereof, and any officer or employé of a railroad company violating any provision of this section or neglecting to comply with any requirement of the railroad commission duly ordered, shall be liable to a penalty of one hundred dollars for every such violation. The supreme court may on notice to the persons or corporations affected enforce compliance with any such order of the railroad commission.

SEC. 6. Section two hundred and thirty of said act is hereby amended to read as follows:

SEC. 230. Forest fires prohibited.—A person who willfully or negligently sets fire to waste or forest lands of the

state or of a private person, or who suffers a fire on his own lands to extend therefrom or to state lands is guilty of a misdemeanor and may be imprisoned not more than one year and be liable to pay a fine of not more than two hundred and fifty dollars or both. He shall also be liable to the state or any person for the damages caused by such wrongful act. If state lands in the forest preserve are or have been damaged willfully or negligently as aforesaid, an action to recover the damages shall be maintained in the name of the people of the state on the order of the commissioner by counsel designated by him, and recovery shall be had therefor. The fact that such fire may have extended to state lands by crossing one or more tracts of land intermediate the place of setting fire and the state lands shall not bar recovery by the state when the damage done is within five miles of the place where the fire was set. This act shall not be construed to limit the recovery in cases where there are no such intervening tracts of land.

SEC. 7. This act shall take effect immediately.

II.

AN ACT TO AMEND THE FOREST, FISH, AND GAME LAW, IN RELATION TO AND DEFINING THE BOUNDARIES OF THE ADIRONDACK PARK.

SECTION 1. Section two hundred and seventeen of chapter twenty of the laws of nineteen hundred, entitled "An act for the protection of the forests, fish and game of the state, constituting chapter thirty-one of the general laws," as amended by chapter six hundred and eight of the laws of nineteen hundred, is hereby amended so as to read as follows:

SEC. 217. Adirondack Park.—The Adirondack Park shall include all lands now owned or hereafter acquired by the state within the following bounds: Beginning at the southeast corner of the town of Hope in the county of Hamilton, and running thence westerly along the southerly lines of Hamilton county and continuing and following the southerly line of the town of Wilmurt, in Herkimer county, to the point of intersection with the westerly line of Herkimer, and thence northerly along the westerly lines of Herkimer county to its junction with the southwesterly line of Saint Lawrence county; thence westerly along said southwesterly line of Saint Lawrence county to the most westerly corner of township fourteen, great tract three, Macomb's purchase; thence easterly along the northerly line of said township fourteen to the northeast corner thereof; thence northerly along the west line of township thirteen, great tract three, Macomb's purchase, to the northwest corner of said township thirteen; thence east along the north line of said township thirteen and the south line of township ten, tract and purchase aforesaid, to the southwest corner of the southeast quarter of said township ten; thence north along the west line of the said southeast quarter of the aforesaid township ten to the north line of said township; thence east along said north line to the west line of township seven, great tract two, Macomb's purchase; thence northerly along the west line of township seven aforesaid to the northwest corner of the township; thence easterly along the northerly lines of townships seven and eight, great tract two, Macomb's purchase, to the southwest corner of township twelve of said great tract two; thence northerly along the west line of township twelve to the northwest corner of lot one in the south half of said township; thence easterly along the north line of said south half of said township twelve to the west line of the county of Franklin; thence north along the west line of the county of Franklin to the northwest corner of the south half of township thirteen of great tract one, Macomb's purchase; thence easterly along the northerly line of the south half of townships thirteen, fourteen, and fifteen of said great tract one, Macomb's purchase, to the west line of the old military tract; thence south along said west line to the northwest corner of township ten of said old military tract; thence easterly along the north line of said township ten to the west line of Clinton county; thence southerly along the west line of Clinton county to the north line of Essex

county ; thence easterly along the north line of Essex county to the northeast corner of the town of Wilmington ; thence along the east and easterly lines of the town of Wilmington to the intersection with the north line of the town of Keene ; thence east to the northeast corner of said town of Keene ; thence southerly along the easterly line of the town of Keene to the southeast corner thereof ; thence easterly along the northerly line of the town of North Hudson to the most northeasterly corner of the said town ; thence southerly along the easterly lines of the towns of North Hudson and Schroon to the southeast corner of the said town of Schroon ; thence westerly along the southerly lines of the towns of Schroon and Minerva to the northeasterly corner of Leggett's survey of the southwest quarter of township fourteen of Totten and Crossfield's purchase; thence southeasterly along the line of Leggett's survey to the southerly line of said township fourteen ; thence southwesterly along the line of Leggett's survey, being the southerly line of said township fourteen, to the most southerly corner of said township ; thence southeasterly along the easterly line of township thirteen and the westerly line of township twelve to the southeasterly corner of lot twenty-five of township eleven of said Totten and Crossfield's purchase ; thence southwesterly along the southerly lines of lots twenty-five, twenty-six, twenty-seven and twenty-eight to the southwesterly corner of said lot twenty-eight ; thence southeasterly along the easterly lines of lots forty-four, fifty-three, sixty-eight, seventy-seven and five of said township eleven and of lots nine, twenty-one, thirty, thirty-seven and forty of the gore between township eleven of Totten and Crossfield's purchase and the Dartmouth patent and of lots five of ranges six, seven, eight, nine and ten of the Dartmouth patent to the southeasterly corner of lot five of said range six of said patent in Warren county ; thence westerly along the southerly line of said range six of said Dartmouth patent to the northeasterly line of Palmer's purchase; thence southeasterly along the easterly line of said Palmer's purchase to the most easterly corner of the middle division of said purchase ; thence southwesterly along the southerly line of the said middle division of Palmer's purchase through Saratoga county to the easterly boundary of the town of Hope in Hamilton county; thence southerly along the east line of the town of Hope to the place of beginning. (County of Hamilton ; the towns of Newcomb, Minerva, Schroon, North Hudson, Keene, North Elba, Saint Armad and Wilmington, in the county of Essex ; the towns of Harrietstown, Santa Clara, Altamont, Waverly and Brighton, in the county of Franklin ; the towns of Webb and Wilmurt in the county of Herkimer ; the towns of Hopkinton, Colton, Clifton, and Fine, in the county of Saint Lawrence, and the towns of Johnsburg, Stony Creek and Thurman and the islands in Lake George in the county of Warren.) Such park shall forever be reserved and maintained for the free use of all the people.

SEC. 2. This act shall take effect immediately.

III.

AN ACT TO AMEND THE FOREST, FISH, AND GAME LAW, TO CREATE A CATSKILL PARK AND DEFINE THE BOUNDARIES THEREOF.

SECTION 1. Article thirteen of chapter twenty of the laws of nineteen hundred, entitled "An act for the protection of the forests, fish and game of the state, constituting chapter thirty-one of the general laws," is hereby amended by adding after section two hundred and seventeen another section, to be known as section two hundred and seventeen *a*, to read as follows:

SEC. 217*a*. Catskill Park.—The Catskill Park shall include all lands now owned or hereafter acquired by the state within the following boundaries, to wit: Beginning in Ulster county at the southeasterly corner of great lot five of the Hardenburg patent, thence running northwesterly along the southerly boundary of said great lot five through Sullivan county to the East branch of

the Delaware River in Delaware county; thence along the southerly bank of the said East branch of the Delaware River to the Ulster and Delaware Railroad at the village of Arkville; thence along the said Ulster and Delaware Railroad easterly to the line between the counties of Delaware and Ulster; thence northeasterly along that line to the southerly line of Green county; thence northwesterly along the southerly line of Green county to the line between the towns of Halcott and Lexington; thence northerly along the easterly line of the town of Halcott to the line between great lots twenty and twenty-one of the Hardenburg patent; thence northerly along said line to the south bank of the Bataviakill; thence along the southerly bank of the Bataviakill easterly to the west line of the state land tract; thence northerly, easterly and southerly along the line of the said state land tract to the line between the towns of Cairo and Catskill; thence southwesterly along said town line to the easterly line of the town of Hunter; thence southerly along the said easterly line of the town of Hunter to the line of the Hardenburg patent; thence easterly, southerly and westerly along the general easterly line of the Hardenburg patent to the line between the towns of Olive and Rochester of Ulster county; thence easterly on said line to the point where the Metcahonts creek crosses the same, flowing easterly; thence southwesterly parallel with the northwesterly line of the town of Rochester to the line between the towns of Rochester and Warwarsing; thence westerly and southerly along the line of the Hardenburg patent to the place of beginning. Such parks shall forever be reserved and maintained for the free use of all the people.

SEC. 2. This act shall take effect immediately.

IV.

CONCURRENT RESOLUTION OF THE SENATE AND ASSEMBLY PROPOSING AN AMENDMENT TO SECTION 7 OF ARTICLE 7 OF THE CONSTITUTION.

SECTION 1. *Resolved* (if the assembly concur), That section seven of article seven be amended so as to read as follows:

SEC. 7. Forest preserve.—The lands of the state, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands, except as hereinafter provided. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed, or destroyed. The legislature may authorize the removal of dead timber on burned areas so far as necessary for reforestation, through officers and employés of the state, but not by contract. The legislature may also authorize the sale of lands outside of the limits of the Adirondack Park and the Catskill Park as such parks are now established by law. The proceeds of such sales shall be set apart in a separate fund and used only for the purchase of lands in such parks. A violation of this section may be restrained at the suit of the people or with the consent of the supreme court on notice to the attorney general at the suit of any citizen of the state.

SEC. 2. *Resolved* (if the assembly concur), That the foregoing amendment be referred to the legislature to be chosen at the next general election of senators, and in conformity with section one, of article fourteen of the constitution, be published for three months previous to the time of such election.

SETTLERS SEEKING GOVERNMENT AID.

POSITION OF THE RECLAMATION SERVICE BRIEFLY OUTLINED—SETTLERS MUST TAKE THE INITIATIVE.

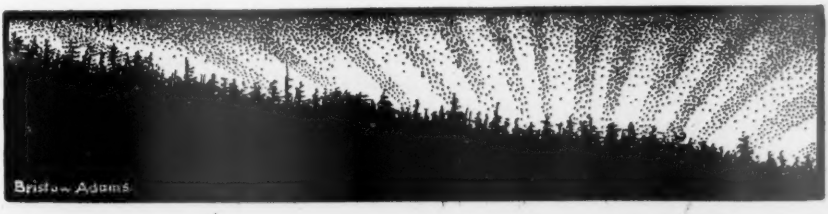
THE operations of the engineers of the Reclamation Service since the passage of the irrigation act have excited widespread interest throughout the country. In many sections of the West irrigation has been developed to a point where the requirements of the land exceed the normal water supply, and the settlers are organizing with a view of securing the aid of the government in the construction of immense storage works to conserve the flood waters now going to waste. The assistance of the government is asked, as the cost of the work is beyond the means of the land-owners. In all such cases the policy of the Reclamation Service has been to make it clearly understood that this assistance can be secured only through the influence of a healthy and sustained public opinion expressed in a direct communication to the Secretary of the Interior from the people. In brief, the direct beneficiaries—the actual land-owners—must take the initiative and organize along lines similar to those followed by the settlers of Salt River valley.

It should be understood that the irrigation projects which naturally appeal most to the engineers are those which are free from the vexing questions of private ownership of land and water. Large enterprises which contemplate the reclamation of vast areas of desert land, yet a part of the public domain, present no obstacles aside from those of a purely physical or engineering character, while the construction of works in settled communities is sure to involve personal features often more trying than anything found in the actual work of construction.

Just now there are several irrigation districts making appeals to the government for assistance, in order that many thousands of acres of crops may be saved from partial or total loss each year by reason of a scanty water supply. In one of these districts, the famous valley of the Uncompahgre, in Colorado, the irrigators and ditch owners have perfected an organization and will present a formal demand for federal aid in the construction of the Gunnison tunnel.

In Montana, Idaho, South Dakota, Oregon, and other states, similar organizations are forming; mass meetings are being held, officers elected, and details considered. The rule of the Reclamation Service in all such cases is one of absolute non-interference. Upon request assistance is given in outlining the proper form of organization required by the Department before definite action can be taken, but in all other essentials the settlers are informed that they must work out their own destiny; that their requests for aid must bear practically the unanimous endorsement of the actual property owners, and must be free from suspicion of politics.

Down in the forbidding Salton desert the settlers are petitioning the government to take up a stupendous work for the fuller utilization of the waters of the great Colorado River. To those making such request, and to all others who in the future may desire the government's aid, the above outline of the position of the Reclamation Service is especially directed.



FOREST PROBLEMS OF MICHIGAN.

EXTRACTS FROM A PAPER READ BEFORE THE MICHIGAN ACADEMY OF SCIENCE.

BY

JOHN H. BISSELL.

SURELY it is a matter of the most serious concern whether the country's supply of timber is failing or not, and whether anything can be done by the individual or the state to preserve the present stocks, to replenish some of the waste and depletion of the supplies, or utilize again the waste places, where once were forests, with the same most valuable crop.

The superficial area of the State of Michigan, as given by the late Professor Winchell, is 56,457 square miles, or in acres—that being the unit most common to the thought of business people—36,128,640 acres, besides 404,730 acres of land on the islands belonging to the state, located in the Great Lakes. Total acreage, 36,533,370.

The number of small or inland lakes is something over 5,000, having a total acreage of 712,864. It may not be an unreasonable guess to say that the area covered by the cities, villages, highways, railroads, and rivers of the state occupy approximately 1,500,000 acres. Taking this, with Professor Winchell's estimate of lake areas, from the total acreage of the state, leaves 34,320,506 acres as the approximate area of the state available for agricultural and forest purposes.

The pine forests have been by far the most valuable, but the whole state was not covered with pine forests. There are twenty-three counties of the state where there was little or no pine. The approximate acreage of these counties having no pine of commercial value is 7,200,000, which, so far as pine is concerned, reduces the area of the state to 27,120,000 acres.

Of this 27,120,000 acres, a portion has been brought under cultivation as farms, mainly, of course, on land formerly covered by hardwood, but some of it land which has grown pine.

The greater part of the land which was once so rich with its stand of the finest white pine and Norway is now waste, and much of it unfit for agriculture, and, so far as we can see now, never will be brought under cultivation. It is only fit for forest. Nature knew that. But we were talking about acres.

Other parts of our 27,000,000 acres were and much now is occupied by a stand of hardwood forest, and from 18,000,000 to 20,000,000 acres of it were pine. This you will see assumes that from 50 to 55 per cent of the acreage of the entire state was originally pine forest. I ask you to remember this approximate estimate of the pine area when we come to speak of the money values.

* * * * * * *

The early settlement of Michigan was along its southern border. The southern counties of Michigan were originally clothed with dense forests of oak, cotton-wood, poplar, black walnut, cherry, bass-wood, maple, birch, sycamore, hickory, and elm, with occasional "oak openings." All statistics, so far as I have been able to find, show that the products of the forest have been the most important factor in building up the industries and wealth of the state, and more wealth has been created for use in industrial development of all kinds from the lumber industries than from any other. If this assertion is not true of all the states of the Union, it certainly is of Michigan, Wisconsin, Minnesota, and some of the provinces of Canada.

* * * * * * *

The total production of pine which we have outlined above is 161,475 millions

of feet, and with the estimate given for the hardwood, cedar, etc., amounts to a total forest production for Michigan of 211,475 millions of feet. The average sale value at the point of manufacture, taken as $13 per thousand, gives for the pine $2,099,175,000, and the hardwood, cedar, etc., $550,000,000—a total forest production for Michigan of $2,649,175,000.

The pine estimate, feet	161,475,000,000
The estimate destroyed, feet	53,825,000,000
Total pine, feet	215,300,000,000
Hardwood, cedar, etc., feet	50,000,600,000
Estimate destroyed, feet	16,666,000,000
Total	66,666,600,000
Probable total of original forest, feet	281,966,600,000
The amount of pine estimated as destroyed	$699,725,000
The amount of hardwood estimated as destroyed	160,000,000
Total estimate	$859,725,000

* * * * * * *

Totaling the statistics of these thirty-eight counties, we have this result: Total acreage, 18,950,000 (about 25 per cent of the area of the entire state); area in farms, 2,460,000 acres, which is 13 per cent of the thirty-eight counties. The acreage of improved land is 953,000, or $5\frac{1}{10}$ per cent, and the percentage of unsettled land is 87 per cent, and the percentage of land unimproved is 95 per cent.

Of these thirty-eight counties, with 18,950,000 acres, 16,486,500 acres are unsettled, and 18,002,500 acres are unimproved.

Why are these lands unsettled and unimproved? Simply because they are, in the main, unsuited to the uses of settlement and improvement for agricultural purposes; but they have the finest soil in the world, with climatic and other conditions most favorable, for growing, not for once, but for all time, the one crop that is most needed, and it is the most valuable that these lands can grow—the white pine.

What should the state of Michigan do about it?

I. Repeal all existing land laws.

II. Acquire all pine stump lands by making absolute all titles through sales for delinquent taxes, by purchase at their actual present value, or by condemnation under the power of eminent domain all lands necessary for protection or improvement of the state's holdings.

III. The enactment of a new land law permitting no sale of public land except for actual homesteads at a fair valuation; the sale of no land until a thorough examination showed it was not needed for the state forest land; the survey and setting apart for state forest land all lands suitable by character and location, and the reclamation of the state lands by replanting and thoroughly protecting the growing forest.

IV. A policy of taxation to encourage private owners in the improvement of their holdings, and one perfectly fair to the inhabitants of the counties where the state lands are located.

In other words, the adoption by the state of a comprehensive, enlightened, and business-like public policy respecting forestry and its enactment into law

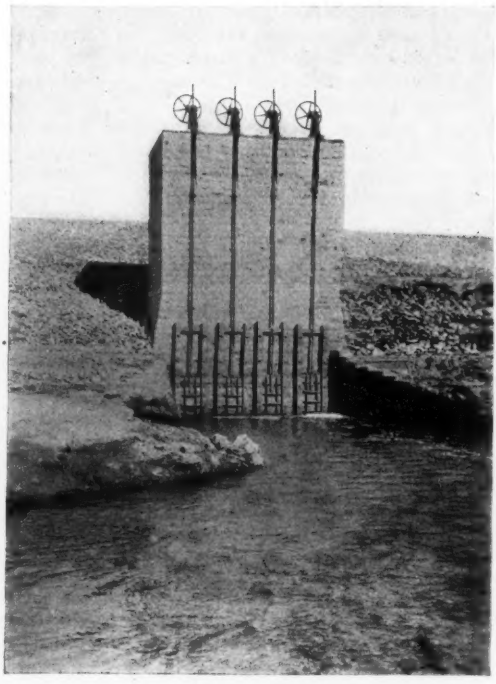
NATIONAL IRRICATION IN WYOMING.

DESCRIPTION OF THE SHOSHONE PROJECT, WHICH IS LIKELY TO BE ONE OF THE FIRST TO BE TAKEN UP IN THE ARID NORTHWEST.

THE Shoshone project in Wyoming, for which the Secretary of the Interior has just set aside $2,500,000, contemplates the erection of a dam 170 feet high, which may ultimately be extended to over 200 feet and which will flood about 3,500 acres. A conduit is proposed through the canyon of the Shoshone with a capacity of 1,000 second feet, to be partly in open

cut and tunnel. The canal covers the high lands and includes an area about two miles in width above the proposed Cody and Salisbury Canal. The main line terminates at Eagle Nest Creek, but can be continued on grade to carry water, if necessary, through the gap into Clark's Fork, flowing north into Montana. Smaller lines terminate at the Bad Lands north of Garland, but may be continued to cover other lands, surveys of which have not yet been finished.

The main canal crosses three ravines by means of steel pressure pipes, the details of which are being worked out. Estimates have been prepared showing the feasibility of this form of structure. The canal system as outlined covers 103,000 acres, of which about 93,000 acres are irrigable, and the surplus water may be used for irrigating lands south of Shoshone River or taken across the divide into Clark's Fork, as before stated.

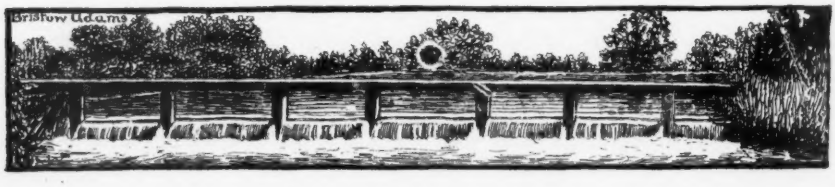


DISCHARGING GATES OF A WYOMING RESERVOIR.

It is probable that a large amount of power will be developed at various points on the canal and utilized for pumping water upon higher lands. The cost of irrigating 93,000 acres of good land, according to the preliminary estimates, appears to be within feasible limits. Extension of canal lines will doubtless be made from time to time, as the plans are so drawn as to permit of the maximum enlargement consistent with the topography of the country.

While the Secretary of the Interior has set aside two and a quarter millions of dollars for the construction of this work, dependent on securing title to the land and water and upon all the engineering details being found to agree with the preliminary plans, there seems to be no reason to doubt the early commencement of this, the first great work of the Reclamation Service in the northwestern part of the arid country.

Engineer Ahern, now in Washington, who has been in charge of the preliminary work on this project, hopes to be able by early spring to put the plans and estimates in the hands of the board of consulting engineers, who will go over these matters on the ground and pass upon the various structures proposed.



GOVERNMENT FORESTRY EXHIBIT.

WHAT IT COMPRISES AND HOW IT IS ARRANGED AT THE ST. LOUIS FAIR.

THE Bureau of Forestry of the U. S. Department of Agriculture has prepared for the Louisiana Purchase Exposition the most extensive display it has ever made. The purpose is both to illustrate the work which the Bureau is doing and to show actual forest conditions in all parts of the country. The visitor will see there the most impressive evidence of what practical forestry is, and also its great present and future importance as a means of promoting the national welfare. Lumbering ranks fourth among the industries of the country, and it is a matter of hopeful promise for the permanence of the industry and for the cause of forestry that lumbermen are adopting conservative forest management in their lumbering operations. That agriculture, incomparably the most important of our national sources of wealth, also depends in no small degree on forestry, is not, however, so well understood. Under intensive methods of farming, and with the enlargement of the cultivable area made possible by irrigation, this dependence will become increasingly close. Mining and grazing, too, materially depend on forestry, for mines demand cheap and abundant timber, and the forage which feeds most of the Western stock is one of the important indirect products which, under proper restrictions, the forest may be made to yield. All of these relationships are strikingly displayed in the forestry exhibit at St. Louis.

The space allotted to the Bureau of Forestry is in two different, though not widely separated, parts of the fair grounds. An indoor exhibit is located in the Forestry, Fish, and Game Building, in which is centered also an exhibition of the lumber industry of the United States. A striking and complete collection of photographic transparencies illustrate forest conditions and problems as they are encountered by the Bureau. Typical single trees and forests, the cutting or harvesting of forests and their renewal by natural reproduction, forest planting in treeless regions or where forests have been destroyed, and damage by fire, insects, over-grazing, etc., are shown most clearly. Nearly all of the transparencies are of large size, some of them 4 by 5 feet. They are arranged to be seen from the inside of an arcade illuminated by natural light, with Eastern and Western forest scenes shown on opposite walls. This series is supplemented by a collection of large colored bromide photographs framed in the panels of the balustrade which surrounds the exhibit space. On the floor between the balustrade and the arcade are cases which display some specially important phases of the Bureau's investigations, together with a collection of all the instruments used in forest work, the publications of the Bureau, etc. Of particular interest is a large case containing longleaf pine trunks which show the advantages of the new system of turpentining promoted by the Bureau and the disadvantages and injurious effects of the old system of boxing. Two other cases exhibit insects and examples of their destructive work. The method of determining the strength of commercial timbers is shown by a testing machine, while the results of tests are shown by charts and tested timbers. There is also a large collection of timbers, both from the United States and Europe, treated by different preservative processes to show the manner of increasing the life of various construction timbers. Several specimens are shown of building and other timbers which have been in use for thirty years or more.

One of the special features of the exhibit is a relief map of the United States cast upon a section of a sphere 16 feet in diameter. By using this type of map the geographical distortion inevitable in flat maps is avoided, and the real relationship of the various parts of the country and their actual position on the globe are correctly shown. The distribution

and character of the forests of the country are shown in different colors, as are the location and extent of national and state forest reserves. The forests managed according to working plans prepared by the Bureau and lands upon which plantations have been instituted under Bureau planting plans are also indicated by special symbols. The situation of forest schools and other institutions which afford training in forestry is shown on the map. On another relief map are shown the location of the proposed Appalachian Forest Reserve, the extent and character of forest and other lands included, and the relation of the reserve to the surrounding country.

The outdoor exhibit of the Bureau is on a tract of 2½ acres situated about 300 yards southwest of the Forestry, Fish, and Game Building. Here are displayed, on and about a model farm, forest plantations suited to every part of the United States, practical forest nurseries, and the best forms of windbreaks which are so important for protection of the western farmers' crops and buildings. The coöperative work of the Bureau in this direction has been very successful, and this exhibit is certain to attract much interest among visitors from the regions in which forest planting has proved its usefulness, both for protection and as a means of providing local supplies of fuel and timber. During the past five years plans for such planting have been put in operation under the direction of the Bureau of Forestry on 210 western farms. The model farm represented comprises a quarter of a section of prairie land laid out on a scale one-tenth the actual linear measurements, to show a model plan for planting trees in a treeless country. Forty-seven forest blocks surrounding this area illustrate pure forest plantations and various methods of mixing tree species. In each of these blocks the trees are given the actual intervals recommended for planting in the different regions to which the illustrations apply. Methods of growing nursery stock from cuttings, transplants, and from seeds are fully illustrated, as are the various styles of screens used for shading coniferous tree seedlings. The cultivation of four varieties of basket willow is also an interesting feature of the outdoor exhibit. Fields, farmsteads, etc., are laid off with growing trees planted along the fence lines and about the home lot.

In addition to the displays described, the Bureau of Forestry will coöperate with the Department of Mines and Metallurgy in a series of comparative tests relating to the best methods of preserving timbers. For this purpose a complete experimental treating plant, consisting of a small cylinder, vacuum, and pressure pumps and tanks for holding the preservative solutions will be in operation on the outdoor tract of the Department of Mines and Metallurgy. Other plants will show the application of the Giussani and Rüping processes. It is expected that one or more runs will daily be made, when ties and timbers from all parts of the United States will be treated. Close to these experimental plants will be found a cylinder whose operation illustrates the best methods of increasing the longevity of fence posts. In a separate building near the treating plants several testing machines will be operated by the Bureau of Forestry for the purpose of determining the strength of different timbers treated by various preservative processes.

The greatest effort has been made in the preparation of the government forest exhibit to give as complete an exposition as possible of the purposes and work of the Bureau. The result, it is hoped, will be peculiarly interesting and instructive to that vast body of citizens whose material welfare is so intimately connected with the adoption of practical forestry.

FOREST FIRES IN MINNESOTA IN 1903.

EXTRACT FROM NINTH ANNUAL REPORT OF THE CHIEF FOREST FIRE WARDEN OF MINNESOTA. EXPLANATION OF THE SYSTEM, WITH ITS COST AND EFFECTIVENESS.

ALTHOUGH wet weather prevailed during the latter part of the summer and in the season of harvesting, there were dry spells in the spring and late autumn. The number of forest fires reported by the fire wardens was 52, which burned over an area of 15,585 acres and did damage to the amount of $28,292. At 27 of these fires, being a little more than half, a fire warden was present to assist in extinguishing and controlling the fire. Of these fires 11 were caused by clearing land, 9 by railroad locomotives, 7 from other known cause, and 25 originated from causes unknown.

The number of prairie fires reported was 35, which burned over 26,308 acres and did damage to the amount of $4,666. At 14 of these fires a fire warden was present and assisted in extinguishing and controlling the same. They were caused, 9 from burning brush, straw, or stubble; 4 by railroad locomotives, 3 by hunters, 6 from other known causes, and 13 from causes unknown.

PROSECUTIONS.

There were eight prosecutions for causing forest and prairie fires, and four convictions obtained. There is naturally great reluctance on the part of fire wardens to prosecute their neighbors or fellow-citizens for carelessness in causing fires.

RAILROAD RIGHT OF WAYS.

Section 12 of the fire-warden law requires railroad companies (which, of course, includes logging railroad companies) to keep their right of way to the width of 50 feet on each side of the center of the main track cleared of combustible materials. This is found to be a rather difficult provision to enforce. While some roads are kept cleared of combustible material in an exemplary manner, there are companies which are habitually neglectful in this regard.

The local service, in preventing and fighting fires, both forest and prairie, is rendered by the town supervisors, who are *ex-officio* fire wardens, and by those whom they summon to assist, and in unorganized territory by fire wardens specially appointed. This service is paid for in the first instance by the counties in which it is rendered, and the state pays to the counties two-thirds of such expense. Up to last year the state paid to the counties only one-third of such expense. It is expected that the counties now will be more prompt and liberal in paying such service. In an ordinary year it may be assumed that the two-thirds of expense the state has to reimburse to the counties will amount to $4,000. The other expenses pertain to the office of chief fire warden, and include his salary, clerk hire, traveling expenses, postage, printing of (12,000 in muslin) warning notices, blanks, circulars, etc., and an edition of 4,000 copies of his annual report.

MONEY APPROPRIATED.

"The item to cover all these expenses," says the chief fire warden, "is found in the general appropriation act under the head of 'Forest Preservation,' and I think the public will be surprised to learn that it amounts to only $5,000. It is an amount—I will not say wholly—but very inadequate for the efficient execution of the law."

Nobody knows when an exceptionally dangerous season may occur. It will not do to wait until it has come. Every spring the local fire wardens in about six hundred towns must be furnished with notices, instructions, and blanks and kept on the alert, so that in case a drouth should occur they will be active in preventing dangerous fires. The economical use of money is in the prevention of fires.

The province of Ontario expends $30,000 and upwards a year in the pre-

vention and extinguishment of forest fires.

This report further states that the standing timber in Minnesota is worth easily $100,000,000, and it is this property which the fire-warden system seeks to protect. The state itself owns 2,500,000 acres of land, a part of which is forested and protected by the fire-warden system. The state last November sold $600,000 worth of timber from its own land, and has in all received $4,000,000 for just the timber sold from exclusively its lands which it received as a gift from the United States. The state will continue for many years to sell timber of various kinds from these lands, and is on this particular account deeply interested in preventing damage by forest fires.

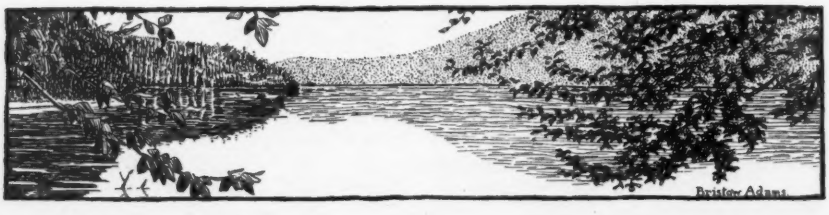
THE ORIGINAL PINE FORESTS DISAPPEAR.

One of the richest pine timber regions of the Northwest was the Saginaw and Huron Shore districts of Michigan. In 1893 there were cut in that district 858,000,000 feet of pine; but the supply of pine timber had so diminished during the next ten years that in 1903 only 52,000,000 feet were cut. The number of feet of pine logs cut in Minnesota the season 1902–1903 was 2,000,000,000. The amount of pine lumber cut in the year 1903 by the mills in the districts of Duluth, Minneapolis, above Minneapolis and St. Croix, was 2,200,628,000 feet, being over two billion feet. A comparatively small amount of this may have been from the forests of Wisconsin. A liberal estimate places the remaining standing pine in Minnesota at 28,000,000,000 feet. Any one can judge for himself, therefore, how soon this forest capital will be exhausted and say whether it is not time to begin a system of reforestation by utilizing waste land in the production of pine timber.

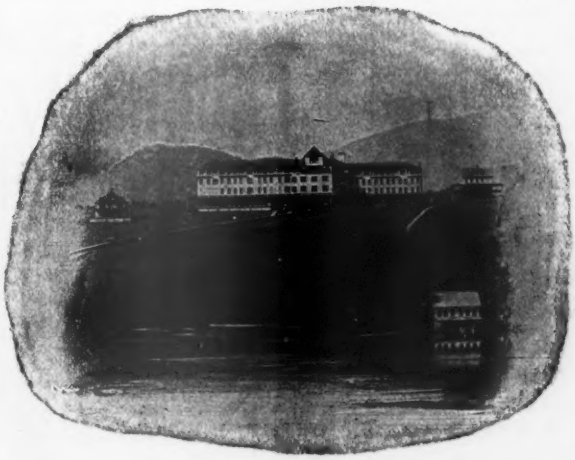
WHAT FORESTRY MEANS FOR MINNESOTA.

What forestry means for Minnesota is simply this: The remaining original pine timber will be cut in the next fifteen years. Some second growth pine, if protected from fire, will then be cut from year to year, but it will not be as good as the original growth and there will not be enough of it for home consumption. Lumber will be dearer and our great lumber industry will decline. There are, however, fully three million acres of waste land in scattered localities, which if planted with pine would in time become normal forests, yielding forever a supply sufficient for home need. Such forests would by their growth perpetually yield a net annual revenue on the capital invested of three per cent, compound interest, besides many indirect benefits. On such waste, sandy land it will take on an average about eighty years for a crop of pine trees to grow to merchantable size. Individuals can not wait so long for a crop and they will not engage in the business. The state, to whom time does not matter, must undertake the work by purchasing waste land and planting it with pine.

The report gives an abstract of the recent laws of different states for preventing forest fires, discusses practical forestry, argues that the state will gain honor as well as money by treating its forests and waste land with scientific care, furnishes sketches of European forestry, and contains several original illustrations of Minnesota forests.



THE GRAND VIEW



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2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

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4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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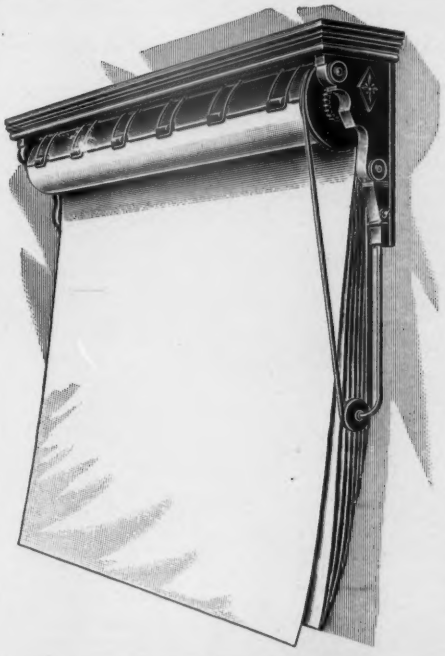

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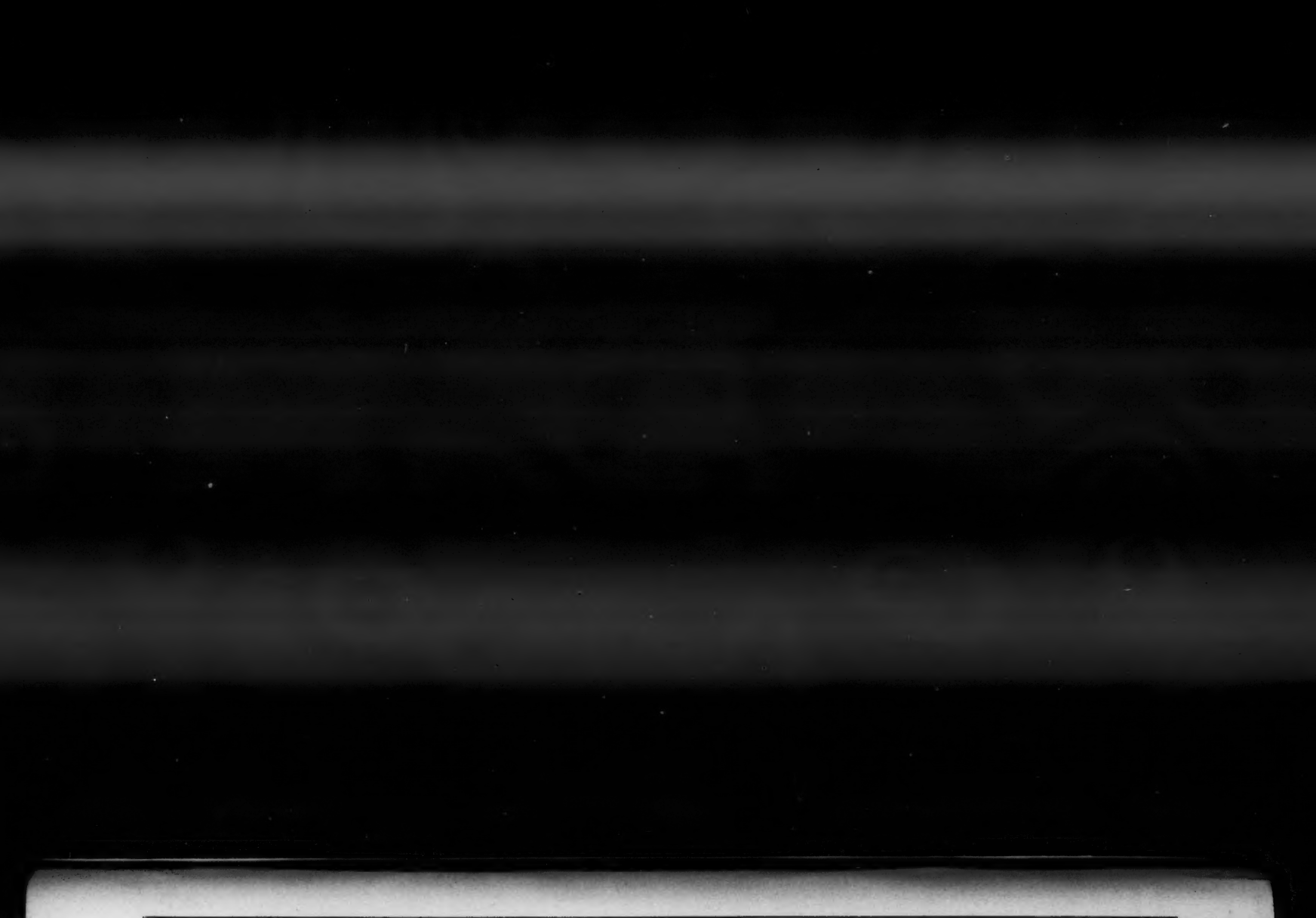
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